

REPORT
OF THE
TEXTILE AND TECHNICAL INSTITUTES INQUIRY
COMMITTEE

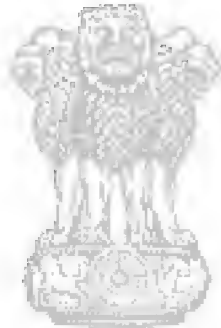
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TABLE OF CONTENTS

<i>Chapters</i>	<i>Pages</i>
I Introductory 	1-2
II Description of the institutions 	3-4
III General observations and recommendations 	5-14
IV Recommendations concerning each institute 	15-24
<i>Appendices</i>	
I Reorganization scheme for the Government Central Textile Institute, Cawnpore, with detailed syllabus 	25-42
II Reorganization scheme for the Government Carpentry School Allahabad, with abridged syllabus 	43-49
III Reorganization Scheme for the Government Technical Institutes at Lucknow and Gorakhpur with detailed syllabus for each course ...	50-68
IV Summary of recommendations 	69-76



सत्यमेव जयते

The Committee was appointed by G. O. no. 4260/XVIII—1380, dated August 8, 1939, and consisted of the following persons :

Chairman

Sir Shri Ram, Managing Director, Delhi Cloth Mills, Delhi.

Members

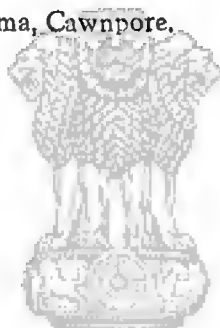
Lala Padampat Singhania, Governing Director of Juggilal Kamlapat Group of Mills, Cawnpore.

Mr. R. C. Srivastava, B. Sc. (Alld), O. B. E., Director, Imperial Institute of Sugar Technology, Cawnpore.

M. Abdur Razzaque Ansari, President, Jamiat-ul-Ansar (Ansar's Association) Cawnpore.

Shri Jugal Kishore Acharya, M. A. (Oxon), Member, Legislative Assembly, U. P., Parliamentary Secretary to the Minister of Industries.

Pandit Balkrishna Sharma, Cawnpore.



Report of the Textile and Technical Institute Inquiry Committee

To

THE SECRETARY TO GOVERNMENT,

UNITED PROVINCES,

INDUSTRIES DEPARTMENT,

LUCKNOW.

Terms of Reference

We were appointed by Notification no. 4260/XVIII—1380, dated the 27th July, 1939, as a Committee to advise on the lines the Central Textile Institute, Cawnpore, the Central Weaving Institute, Benares, and the Technical Institutes, Lucknow and Gorakhpur, should be reorganized. By a subsequent letter no. 6232/XVIII—1087, dated the 31st October, 1939, we were directed also to consider the question of the reorganization of the Government Carpentry School, Allahabad, and of the Government Central Woodworking Institute, Bareilly, and to ascertain how these institutions can better serve the requirements of industry and of the students. Our Terms of Reference were as follows :

(1) To inquire into the working of the Central Textile Institute, Cawnpore, the Central Weaving Institute, Benares, the Technical Institute, Lucknow, and the Technical Institute, Gorakhpur, and to advise Government as to the measures that should be adopted for making the instruction imparted in these institutions more effective and in consonance with the requirements of the industry.

(2) To suggest, in particular, measures which should be adopted to ensure the highest standard of practical training for the students of these institutions, in collaboration with industrial organization,

(3) To consider whether it is justifiable to maintain the Central Textile Institute, Cawnpore, entirely from Government revenues, and to consider whether it is feasible to secure any financial support from the industrial organizations interested in the textile industry.

(4) To consider whether it is possible to devise a system by which students may receive theoretical training in a central institute and get the necessary practical training in factories.

Mr. H. A. Wilkinson, unfortunately, was unable to join us as his firm was busy with the execution of Government war contracts, and place on the Committee was not filled by Government.

Itinerary

We assembled at Cawnpore on the 3rd January, 1940, and commenced our enquiry with an inspection of the Central Textile Institute. We then proceeded to Benares and thence to Allahabad, concluding the first stage of our inquiry. We reassembled at Cawnpore on the 30th January and proceeded in turn to Gorakhpur, Lucknow and Bareilly and returned to Cawnpore on the 3rd February to review and consider the evidence we had taken at these places. Our visit to each centre lasted just a day in the course which we inspected the building and equipment of each Institute, received the Advisory Committee attached to them and heard the Principal and staff and representatives of past and present students. The inclemency of the weather on the day of our visit to Bareilly perhaps prevented the Advisory Committee of the Central Woodworking Institute from appearing before us.

Acknowledgements

3. We record with appreciation the valuable services rendered by our colleague and Secretary, Mr. M. B. Hudlikar. The memoranda he supplied us with regarding the working of the institutions were of considerable help to us in assessing their problems. We also render our thanks to Mr. Sinha of the B. & N. W. Railway, for placing at our disposal a carriage which enabled us to visit the various centres without suffering the discomfort of frequent entraining and detraining. We have also to thank the witnesses who tendered evidence before us at Cawnpore and Lucknow and we acknowledge our obligation to them for the useful and valuable suggestions they gave us and thus assisted us in our inquiry.

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CHAPTER II

DESCRIPTION OF THE INSTITUTIONS

4. In order to present a composite picture and to enable those who are not familiar with the institutions to better understand our suggestions, we give in this chapter a very brief account of them. A fuller account of the institutions, of their rules of and qualifications for admission and of their curricula is given in the appendices to this report.

Central Textile Institute, Cawnpore

5. This institution is a technical school for textile workers in mills and offers training in (i) General Textile Technology and (ii) Chemical Technology of textiles. The General Textile section has a Diploma course, consisting of four years' training, a part-time apprentice course of two years and a part-time artisan course for one term of five months. The Chemical Technology section has a Diploma course also of four years and an Artisan course of two years. In addition, the Peripatetic and Tuitional classes in Dyeing and Printing attached to the latter section, impart instruction to the cottage workers of the Provinces at their houses.

Central Weaving Institute, Benares

6. This is intended for the handloom weaving industry and is expected to carry on experimental and research work in addition to training. The objects of the Institute are:

(1) To undertake experimental research work for the benefit of the handloom industry.

(2) To provide technical instruction in handloom weaving which would qualify students to take charge of weaving schools as superintendents and instructors and to work in factories on business lines as managers and mistris.

(3) To provide practical instruction in improved methods of handloom weaving including preparation, finishing, designing and dyeing in order to enable students to work profitably as weavers in their cottages or in factories. The courses of instruction are: senior weaving course of three years' duration, Artisan course of one year, Juinor Class course, for those who possess an Artisan course certificate, of one year and Advanced course also of one year.

Government Technical Institute, Lucknow

7. The courses of instruction in this Institute are:

(a) Electrical Engineering course: three years in the Institute and two years' compulsory workshop training thereafter.

(b) Mechanical Engineering course : three years at the Institute and two years' compulsory workshop training thereafter.

(c) Light Machine Mechanics' course of three years' duration.

(d) Painting class : three years.

(e) Oil Engine Drivers' class of $5\frac{1}{2}$ months' duration.

In addition to the above classes are held from 7 a. m. to 12 noon on Saturday mornings for trade apprentices serving in railway workshops, factories and mills in Lucknow.

Evening classes are held on Mondays, Wednesdays and Fridays for $1\frac{1}{2}$ hours each day for giving literary training to workmen engaged in railway and other workshops.

Government Technical Institute, Gorakhpur

8. The object of this Institute is to provide technical training in various trades connected with mechanical and electrical engineering and it specializes in training mechanics. The courses are :

(a) A combined Mechanical and Electrical Engineering course of three years in the Institute and two years thereafter in a recognized workshop, and

(b) an Artisan section in electrical wireman's work of three years, Engine and Bolier Attendant's work of three years, Carpentry and Pattern-making of three years, Moulding and Casting of three years, Iron work of three years and Machine shop work of three years.

Government Carpentry School, Allahabad

9. The object of this Institute is to impart training in the methods of manufacture of furniture and general woodworking by hand labour. The following are the courses : General Woodworking class of three years, Advanced Woodworking class of three years, Teachers Training class of two years, Polishing and Painting class of three years, Upholstery class of three years and Artisan class of two years.

Central Woodworking Institute, Bareilly

10. The courses of instruction consist of the following : an Artisan course for Cabinet-making and Joinery of two years, a General Woodworking course for Cabinet-making and Joinery of three years, an Advanced Cabinet-making and Joinery course of two years, a Cabinet-making and Joinery foreman course of two years, a Painting, Polishing and Wood-finishing course of two years, an Upholstery course of two years, a Machine Tool course of three years and a Kiln Operators' course of one year.

CHAPTER III

GENERAL OBSERVATION AND RECOMMENDATIONS

Results

11. The objects which these institutions are designed to fulfil have been stated to be to train cottage workers and other artisans in improved methods and help in the improvement of their technique, to enable middle class young men to secure employment in industry and to supply industries with trained men to take charge of industrial work in various capacities, and to help middle class young men to set up their own industrial business. In industrial education, more than in any other, it is the results that we look for and judged by this standard the institutions generally have been mostly lamentable failures for various reasons stated, later in the report. We have scrutinized the record of the employment of and the remuneration earned by past pupils of these institutions, we have heard the evidence of trained students who have set up their own businesses and of those who have found employment, we have elicited information from employers of men trained at these schools, all of which have forced the painful conviction upon us that these men, as compared with their untrained compeer, have, barring a few exceptions, fared no better on account of their training and that on the contrary they have wasted three or five or more years of their career, that Government's well-intentioned efforts at economic improvement have been largely fruitless and that in a majority of cases young men have been misled into believing that they were being given a training out of which they could earn a decent living.

12. A further evidence of this distressful state of affairs is to be found in the request most insistently made by the respective Advisory Committees, the Principals and the students that we should recommend methods of coercion to be adopted by Government to secure not only that students were freely admitted by industries for apprenticeship training but also that they absorbed trained students by providing them with employment. The suggestion was that all industries which had contracts from Government or which were otherwise patronized by Government, by the co-operative societies or by rural welfare works should, on pain of such contracts being withheld or such patronage being withdrawn, be placed under an obligation to train and employ institute pupils. Every one of them complained to us that trained men do not get any encouragement from industry. Though there may be some force in what they say, strangely enough, this does not appear to have led

to introspect why it is that trained men do not get encouragement. Had they done so, they would have found the beam in their own eye rather than the mote in industry's. Admittedly industry sets little store by the boys trained at these institutions and it has no use for them. This is indeed a sad commentary upon the products of the institutions designed to assist industry by providing it with trained men.

13. We proceed to enumerate what we consider to be the factors which have contributed to this utter lack of confidence on the part of industry in the boys trained in these institutions. The first undoubtedly is the unreal system of education. The prevalent method of giving the instruction militates against the foundation of a sound industrial training, for these institutions do not reproduce the conditions and atmosphere of a factory but are modelled on schools and colleges of a literary type which prepare boys for clerks' posts or for professions such as a lawyer's where holidays and vacations are numerous. Nearly half the year in these institutions is thus spent in holidays and vacations and the six or seven hours instruction a day is tinged too much with class and book method. After three or five years of such easy-going training, is it surprising that the students find themselves unprepared for and unsuited to factory work and life? An industrial training should, we consider, be a prelude to and a preparation for the strenuous life and working conditions of a factory whereas these institutions are run differently. Until the academic atmosphere which too firmly clings to the instruction given in these institutions is replaced by a "works" atmosphere, we fear that the instruction imparted in these schools will continue to be characterized by the same degree of futility as in the past. If we start from a fallacious beginning, we cannot but fail in the end.

14. We have heard the argument that the pupils being of immature age require tender treatment but we cannot subscribe to this view as boys of the same age have successfully stood the harder conditions of cottage and large-scale industry. We consider that the system of instruction, ostensibly devised to suit the tender age of the students, which exalts theoretical education and subordinates practical training to a relatively secondary and minor role must be reversed. Class-room lectures and note dictation are understandably popular methods with instructors and pupils; there is no strain and each is happy to have an unarduous and unexacting time. The pupils being young do not of course realize their full responsibilities, and most of the teachers would ordinarily wish for a continuance of easy conditions. It cannot be that the futility of the training imparted in these institutions to equip men for the occupations they are intended to pursue has not been pointed out to them. Successive committees have ended their recommendations with the same refrain that the training should be

given an industrial and commercial bias, but apparently any radical suggestion, however sound it may be, fails to move vested interests. We are aware that this is strong language but we have seen the stark tragedy of wasted lives, we have heard from the mouths of men trained at these institutions pitiful tales, and almost all of them eke out no more than a bare subsistence living, facts too poignant for words. A noble effort in spending on an average not less than Rs. 1,500 per pupil to equip him to earn his living and to improve the country's economy has been, in our opinion, wasted.

15. It is no mere idle adage that an ounce of practice is worth more than a ton of precept. No amount of theory can be a substitute for practice and until this is realized we shall continue to produce men unacceptable to industry. The Industrial Commission was of the opinion that in preparing men to become mechanics and engineers theoretical instruction should occupy no more than a third of the time devoted to practical work. We share this view entirely and consider that it applies to all industrial education.

16. No consideration has apparently been given to the needs of trade and industry in preparing these pupils. The institutions have not studied the markets for which they cater but have only given the pupils some knowledge of mechanics and then turned them out to try and find employment for themselves as best as they could. The institutes have not adapted themselves to the requirements of industry but on the contrary they expect industry to adjust itself to the so-called trained men they send out.

17. Another factor which has marred the utility of the training given in these institutions is the utter lack of appreciation of the value of time and output. We called for returns showing the extent of commercial operations at these institutes, which we consider to be some indication of the degree of success of the training. Barring the Bareilly Institute, the value of commercial operations in these institutions is inconsiderable. In Benares and Gorakhpur the value of the production excluding the cost of the raw material is no more than about Rs. 300 a year. A hundred and fifty pupils working for, say, 215 days in the year turn out practical work the labour value of which is only Rs. 300 which means that the wage per pupil per day of four hours is no more than two pies. Even after making allowance for the high rate of wastage in students' work, this is such a ridiculously low figure that it cannot but lead one to the conclusion that the practical training is grossly inadequate. This neglect of the most important aspect of the training is the gravest defect of the system and explains the reluctance of the industry to absorb students of this standard. A man who has not worked under actual competitive conditions where

incentive to better and greater production does not come into play has really learnt little of his work in spite of three or five years' training. Time and labour saving are of vital importance and of these the men trained in these institutions have no conception. The encouragement of industrial habits and commercial enterprise is conspicuous by its absence. Our conception of industrial training is that it is one which enables the student to practise the trade under competitive conditions on leaving the school, and this is far from being the case with these institutions.

18. We come to the third factor, the absence of factory atmosphere. We have adverted to this incidentally and briefly in a previous paragraph. Training in an industrial institute, be it ever so well-equipped and conducted, cannot be more than preparatory. Twenty five years ago Sir Frederick Nicholson pointed out, and it is still true, that "one cardinal error in Indian ideas is that the Institute can provide experts who can at once establish and manage industries in which they have received the preliminary training whereas it is only after long and detailed work in a going factory both on the technical and business sides that such men can take their place as experts and managers. The Technological Institute is no royal road to expertism as men fondly hope. In India young men are thought to be industrial experts because of certain diplomas whereas they are only competent to understand their respective industries." What we should aim at is the transplantation of a part of the factory in the institutes. Practical training should, we consider, form the backbone of the instruction.

19. A practical and efficient staff is an essential prerequisite to the success of an industrial institution but it is our painful duty to have to say that in no institution which came within our observation did we find a really satisfactory or competent staff. There were exceptions but they were very rare indeed. We would not be honest to ourselves or to Government who have entrusted us with this inquiry if we minced our words or concealed our profound disappointment with the staff generally which appeared to us altogether unsatisfactory and very much below the standard to which we think the staff of these institutions should conform. Many of them had never worked in a factory and numbers of these had lost touch with recent developments. Most of them had not the faintest idea of factory conditions and commercial equipment and working. We consider that the staff of these institutions should be recruited from the ranks of those who have made good in the industry to the extent of getting a good living out of it. The training should be given by master tradesmen and not by class-room lecturers. These remarks apply especially to heads of institutions who should have theoretical qualifications followed by considerable "works" experience. For technical subjects especially, craftsmen should be imported from commercial undertakings.

Stipends

20. Students belonging to most of the institutions urged before us that the stipends allowed to them are inadequate and that they should be increased. We appreciate Government's object in giving stipends to attract pupils, particularly of the artisan classes who, were they not induced by small money grants as some compensation given to their parents for the loss of their services in the family trade, would be unlikely to take advantage of the training. A system of stipends is, in our view, an altogether wrong approach to the problem. As was observed by the Industries Reorganization Committee, the percentage of artisan class boys was even less than 17 per cent. of the total admission to these institutions. Under an apprenticeship system a boy gets his training in a trade by paying a premium although he gets most of it back in the form of wages for work done. We on the other hand pay pupils to undergo the training and the experiment has been a proved failure judging by the products of the institutes. The apprenticeship system turns out better craftsmen largely because it creates an incentive to learn which is definitely lacking in the system of fixed stipends. A regular allowance unrelated to the quality and quantity of practical work turned out by the pupil offers no incentive to profit by the training. We therefore consider that the system of stipends should be abandoned and there should be substituted in its place a system of wages based on the quality and quantity of work judged by competitive standards which take account also of the time taken for the work. Under the system we envisage there will be created in the pupils an interest in the work, a desire to improve the quality of the work, and a zeal to earn as large a sum of wages as possible. We consider that the system of stipends should be restricted to the initial period of say six months, during which the student is learning the basic principles. In the subsequent period there should be substituted a system of wages. We realize that the rate of wages which will have to be paid will of necessity have to be higher than the market rate and we would make it quite clear that the amount to be allotted in the budget should not be less than the amount now provided for stipends.

Demand for Degrees

21. A demand was made by students of the Gorakhpur and Cawnpore Institutes that on completion of their course they should be awarded a degree instead of a diploma as at present. This betrays an academic mentality and is not in keeping with the definitely practical nature of education which we have advocated. Prospective employers among industrialists are not, as a rule, persuaded by mere degrees into engaging men who are otherwise unsuitable for the work. At the same time we realize that for certain posts, specially those under Government departments or under public bodies, such as municipalities, improvement trusts, and railways,

a degree often makes it easier to secure employment. It would be unwise, however, to alter the system of education on this account, and whilst we do not recommend any modification of the existing system, we would suggest that suitable steps should be taken by the department for making known to prospective employers the nature of training which is given at these institutions.

Employment

22. We have already referred to the fact that the boys trained at the Institutes receive little encouragement from the industry. The main reason can only be that the boys fail to come up to the industry's requirements. In view of the changes which we have suggested we think that there will not be much difficulty in obtaining employment but we also think that the heads of the institutions and the department should do everything possible to find employment for the students and should take all possible steps to bring them to the notice of the employers. We earnestly hope that industry will realize its own responsibilities in the matter of providing greater opportunities to trained students of the institutes and employ more and more of such students in the future. We suggest that for this purpose the Principals of the institutes should keep themselves in close touch with industry. We proceed to make certain suggestions which we believe will produce a better class of men acceptable to industry.

Duration of courses

23. We recommend that in every institution not only the hours per day should be increased but that the number of working days in the year should be considerably more than what they are at present. We concede that it is desirable that the increase in the working hours per day should be gradual and we accordingly propose that they should be 42 hours per week in the first year, 45 in the second and 48 in the third. We also consider that the number of working days in the year should be increased to 275 in all the years. This would render possible an increase in the hours for practical work.

In view of our having increased the number of hours and days, which increase we consider should be set apart for practical work alone, the amount of money required for purchasing raw materials, for payment of wages and for providing for greater wastage will obviously be much more than in the past and Government should, when framing its budget, bear this in mind and provide larger allotments. It is needless to say that the amount of money spent on commercial operations will come back to Government.

24. The anomaly of long courses occupying a considerable slice of the active lifetime of the worker coming from a stock known to be notoriously short-lived on the average and rendering his useful earning period relatively shorter, has struck us most glaringly and our aim has been to make available

a longer earning time to the worker and to accomplish this desirable end in a way not only without detriment to the quality of the training but on the contrary in several respects to improve it.

25. We further suggest radical changes in the system of training. The first is that theoretical instruction shall be subordinated to practical which is to occupy a much greater amount of time than in the past. The time devoted to drawing shall be appreciably reduced without affecting the standard. Even between two similar institutions we found that about the same standard is reached in one in a shorter period than in the other. We think that about 50 hours' instruction in drawing during the whole course will be ample for the requirements of most pupils except those qualifying for diploma in Engineering and that the hours of minimum instruction varying between 200 and 250 during the course at present given merely overloads the syllabus without any corresponding gain for the majority of students undergoing the training. The time at present devoted to the subject gives it an importance out of all proportion to its utility to the majority of trained men. If this arrangement, however, is not found to work satisfactorily, the time for this subject may be increased. By the over-emphasis on practical training, by the substitution of a system of payment of wages for practical work done for fixed stipends, by the imparting of a business training, we hope to introduce a factory atmosphere which we believe will produce a class of men better fitted for the work and duties expected of them.

Dignity of Labour

26. There is one feature which seems to us to merit the strongest condemnation, that is, the provision of coolies in the staff of all the institutions. We consider it unfortunate that a boy who is trained to earn his living by using his hands largely, should at the very inception of his training, be led to think that there are some kinds of work which it is beneath his dignity to do and which are to be done by coolies. It vitiates the training at the very outset, it distorts the boy's outlook and it leads him to believe that he is a white-collared worker. Industry has little room for such workers and the misfit between the pupil thus trained and industry's requirement becomes wider. Boys should be put to the work done by the coolies and this item of expenditure should be considerably curtailed if not entirely eliminated from the budget provision.

Short-term engagements of staff

27. We also found that in most institutions the teaching staff confine themselves to the class-room and leave the practical instruction entirely in the hands of mistris. We have the phenomenon that the less useful a teacher becomes, the more he gets paid for it. We propose, therefore that the teachers, at any rate those having charge of technical subjects,

should be engaged on short-term contracts of not more than five years duration, which will not ordinarily be renewed unless the teacher can show that he has kept himself up to date in his subject. We are not aware of the terms under which the present staff has been entertained but if some of them can be retired, we suggest that it be done and that in other cases an efficiency bar be introduced.

Artisan and non-artisan courses

28. We consider this to be a needless duplication and an unnecessary dissipation of the energies and resources of the institutions, taking into account especially the fact that the preponderant majority of the boys in the classes intended for the artisans are of the non-artisan castes. We recommend that the distinction be abolished and that a combined course be introduced for all pupils.

Selection of pupils

29. We feel that not enough attention has been devoted to this important aspect of the problem with the result that a not insignificant number of the boys trained are later on found to be physically unfit or otherwise inapt. In order that there may be no wastage we recommend that prior to giving the training, pupils seeking admission should undergo a satisfactory test regarding physical fitness.

Inspection

30. We elicited the fact in the course of our inquiry that very little control is exercised over the working of the institutions. The department's inspections are few and far between and the Principals enjoy a degree of autonomy untrammelled in the least. The only so-called supervision appears to be of an entirely indirect character, the appointment of outside examiners to conduct some of the annual examinations. This drastic decentralization has been the cause of the deterioration of many of the institutes. Some of the Principals have been alive to their responsibilities but others have not been impelled by the same high appreciation of their duties with the result that some of the institutes have drifted to a very bad state of inefficiency indeed. We would suggest that to prevent this inertia creeping into these schools there should be appointed an expert panel of outside businessmen whose function it should be to inspect the institutions periodically and submit comprehensive reports to the department. A fee should be paid for these inspections and we have no doubt that the money would be well spent.

Advisory Committees

31. Advisory committees are likely to slacken their interest in the institutions if they find that their recommendations are not accepted by the Government and given effect to. This appears to have been the experience of a number of the advisory committees and in order that the committees

interest in the institutions may be sustained we would suggest that their recommendations should be adopted by Government without undue delay except perhaps in very rare instances where a convincing and cogent case exists against their adoption. Members of the Committee, specially those drawn from the industry, should be requested to inspect the school from time to time and to make suggestions in their inspection reports for introducing improvements. Their good offices should also be utilized for making arrangements for the practical training of students and for their securing employment.

Instruction in the vernacular

32. We have had evidence and we ourselves are convinced that instruction in the vernacular would produce better results. This is being done already in the carpentry schools and in the Weaving Institute at Benares and we see no reason why it should not be extended to all centres. We recognize that the other institutions stand on a slightly different footing and we are prepared to admit that for some years in the beginning it will not all be smooth sailing. The lack of text-books and literature on the subjects in the vernacular will doubtless be a handicap but we do not consider it will be an insurmountable one. The compensating advantages are very great and instruction in the boys own language will certainly enable a better understanding of the instruction. After all, pupils admitted in these schools generally do not have a very sound knowledge of English to grasp without difficulty and effort what is being taught.

33. We attach the greatest importance to our recommendation that the grant of a diploma or certificate shall be conditional entirely on the attainment of a prescribed standard of efficiency in quality and quantity of output performed under competitive and business conditions.

34. We suggest that at Benares, Bareilly and Lucknow, museums be established with a view to demonstrate and popularize machinery used in cottage industries in other countries. We believe that if cottage industry is to survive in this increasingly mechanical age it should enlist to its aid improved methods and labour-saving devices; otherwise it would become uneconomical to the workers and uneconomic to the country. Primitive methods have no place in modern economy and it should be the constant aim of these institutions to evolve new and simpler machines which reduce not only the physical effort and time required in manufacture but which also render production more economical, allowing a greater margin of reward in the industry.

35. The institutions appear to us to have had too ambitious an aim, that is, to produce men for the superior services for which there are only a few openings and they have failed. Not only is the material not of the standard which could be adequately responsive to the training but the

training itself is defective. We suggest that the institutes should have a more modest aim and objective and that their efforts should be primarily directed to training men for junior supervisory posts and regular trained workmen standard. If we give a sound practical training for junior posts the occupants will after a time become senior men because of the training they have had. It is only in these directions that the demand exists and the institutions should cater for what the industry requires and not produce unwanted men or men for whom there is no reasonable prospect of absorption in the industry. Of the fact that a majority of the present and previous batches of students who have been trained in these schools are unwanted we have not had the least doubt. That large numbers of them are unemployed and that requests have been made to us to recommend Government's good offices and powers being used in this behalf are further evidences of the fact. The instruction has been based on lines for which the majority of the men trained are likely to have no use or opportunities. What we suggest is that for the few who desire an advanced type of instruction facilities should exist but this should not be imposed on all the pupils in the case of many of whom it would only be a waste of time and effort. For students of exceptional merit and promise advanced training will be available at the institutions and we would stress the fact that what is to be sought is not a diploma but the real training which would be of use to the student and which would help him effectively to get a suitable employment.

36. The prospectuses of these institutions should be carefully revised to see that no exaggerated ideas of the value of the training are created in the minds of the pupils and their parents. We would refer, for example, to the statement in the prospectus of the Gorakhpur Institute which says that even when serving apprenticeship pupils trained by it get allowances ranging from Rs. 60 to Rs. 80 per month with free quarters and that many of them have been entrusted with independent charge of shift duties. The evidence we had showed us that pupils on the completion of their course, that is after apprenticeship, find it extremely difficult to get more than Rs. 30 per month if they are lucky to get even that.

CHAPTER IV

RECOMMENDATIONS CONCERNING EACH INSTITUTE

Central Textile Institute, Cawnpore

37. We suggest that the prospects of the cotton textile industry interests in the Province taking over into their hands the management of the institution be investigated in consultation with those interests. The institute would then become an aided one getting from Government a grant not exceeding 75 per cent. of the present expenditure. We feel that the control and supervision of the Institute by a body of men actively connected with the industry is a consummation devoutly to be wished. Till such time as this desirable change is accomplished and so long as Government retains the responsibility for the Institute in its own hands, we suggest that the management and control of the Institute should be vested in a managing committee consisting of representatives of the industry and one Government member. The committee should have large and real powers of control and guidance. We further suggest a number of reforms with the object of making the Institute more useful to industry.

38. We recommend that greater care be exercised in the selection of pupils so as to prevent boys with no natural or acquired aptitude for the industry, wasting their careers and the efforts of the Institute. To safeguard in some measure against this wastage we suggest that in the first year after admission, the aptitude and physical fitness of the boys should be subjected to a test. The first six months would be devoted to instruction of an elementary type in general mechanical subjects such as fitting, turning, etc. and in spinning and weaving. We see two advantages in boys being taken through this course, firstly, that a good foundation will have been laid, and secondly, even if the pupil should be found unsuitable, he will have acquired a knowledge, although only elementary, which will be of some use to him in this mechanical age. The six months' course will be a rapid survey of general mechanical subjects and the first principles of spinning and weaving. After this preliminary instruction the boy should be required to put in 150 working days in a mill. During this time the Principal will keep himself in touch with the boys by occasionally visiting the mills and supervising their work. The advantage of this method will be that technical instruction follows a period of experience instead of preceding it when a student can have only a very vague comprehension of the subject. With this experience the boy will profit better by the instruction. The Institute would thus be sowing the seed in ground not entirely unprepared for it.

39. We consider that the scheme of syllabus of the Institute admits of a considerable degree of improvement. The Advisory Committee of the Institute told us that they merely acquiesced in the framing of the syllabus, implying thereby that it is not exactly what they wish. We have entrusted to a sub-committee who are experienced in this line and who are thoroughly competent to undertake the work, the preparation of the revised syllabus for the Institute. We have indicated to them our general views upon the subject and we have the utmost confidence in their judgment and wisdom and we have not the least doubt that the proposals they have framed and which are set out in one of the appendices to this report will achieve the objects we have in view.

40. We revert to the question of the duration of the course. In our general observations we stated that the increase in the number of hours of instruction per day and the more appropriate rearrangement of the syllabus and the greater intensification of the courses we recommend will set free a considerable period of time by which the course could either be reduced or more intensive training could be given. As regards this particular institution, the course will still consist of four years in all, the first to be spent in preliminary instruction and in mill working, the second and third years to be spent at the Institute and the fourth year in apprenticeship training of the mills.

41. We indicate certain features which we desire the Institute to give greater attention to in the course of the two years' training. Firstly the pupils should be given the opportunity of dismantling and re-erecting the machines so that they may have an insight into their working and understand the functions of the various parts. In these two years this should be done at least once with all the various machines. The existing machinery at the Institute should be set apart for this purpose. We recommend that the Institute be equipped with a set of new machines to be used for practical work and for operations on commercial lines. We consider that a sizing machine is necessary for the Institute and that this should be provided.

42. We would emphasize that instruction in theory should not be given in isolation in the class-room but be accompanied by instruction in the workshop by a practical demonstration. We consider that an appreciable smaller part of the time should be devoted to theoretical instruction and that even in such an attenuated course, instruction in subjects of everyday importance to the pupil should predominate. We definitely disavow the syllabus being loaded with a multiplicity of subjects not necessary for the majority of the boys trained. Provision would exist for the imparting of advanced instruction in particular directions for such of the boys may desire it. We would much desire the evolution of a system which rendered

home preparation on the part of the student unnecessary. We wish that instruction at the Institute should be so complete and practical as to be entirely self-contained and thorough.

43. In the final year which is to be spent in apprenticeship with the mills, it was stated by a number of witnesses before us that mill managements take very little interest in the progress of the pupils sent by the Institute for practical training. We are satisfied that this impression is unfortunately justified but we would make a special appeal to the mills to ensure that the boys sent to them for training are looked after by the staff of the mills and to make it the responsibility of a junior officer of the mill to fill and transmit to the Institute weekly diaries with details of the work done by the pupils. Unless there is co-operation between the industry and the Institute the instruction will not be of the best and the purpose of the Institute to serve the industry will remain unfulfilled. Perhaps in the past the attitude of the industry towards the apprentices has not been very encouraging but we would make an earnest appeal to mill managements to assist Government by offering advice, by pointing out any changes they consider necessary to improve the institution and by employing these students in greater numbers.

Dyeing and Printing

44. Not many mills in the country have dyeing and bleaching plants and representatives of the industry told us that the absorption of dyers in the industry will not be more than two per year for the entire Province. But even for these, men with a better training are preferred and we feel that in view of the admittedly advanced standard of knowledge possessed by men who have passed through the Bombay University Textile Chemistry Department, the Institute's aim should primarily be to equip men to fill junior posts in mills or prepare them to start their own dyeing and printing businesses or to train them to teach improved methods to village workers. As opportunities of absorption of dyers by large-scale industry are thus very limited, we feel that the nomination of candidates for training as mill dyers should be left in the hands of the mills as there would then be openings for boys on the completion of their courses. For the training of other dyers and bleachers, such as those who hope to set up their own business in this line and who are intended to be rural teachers, the selection will be in the hands of the Principal.

45. We therefore not only agree to the retention of this department in the Institute but we recommend the addition of necessary machinery at a cost not exceeding Rs. 10,000. We contemplate that in the training for even this class, the qualification of 150 working days in a mill should apply if it can be arranged, but if it cannot be done, such training should be given in the Institute itself.

Research

46. We are fully aware that the future prosperity of Indian industry depends in no small measure upon the extent to which research is enlisted for its further efficiency. But we have carefully considered the question whether "research" of the type now pursued by the Institute has been of much value. We have elicited the evidence that the occasions on which the Institute has been consulted on practical difficulties experienced by the mills in the processes have been few and far between. And even had such requests for assistance been more frequent, we doubt whether any really sound advice could have been given under the conditions existing in the Institute and with the equipment available. We consider that on many problems connected with the cotton textile industry, research could safely be entrusted to the Technological Laboratory of the Indian Central Cotton Committee. We are of the view that for conducting research of any use the most perfect conditions and equipment are necessary and that if it cannot be done under such conditions, it had better not be undertaken at all. Not only would research made under existing conditions in the Institute be valueless but it may even be positively harmful and completely misleading. While we do not entirely preclude the possibility of research being conducted at the Institute, we consider that, for the present, it is not necessary or desirable, except in the case of cottage industry.

47. We feel that it would be of great advantage if arrangements could be made with local mills to spare their spinning and weaving masters and other heads of departments to give instruction to the students for an hour or so each week. We suggest that the feasibility of making such arrangements be investigated carefully. *नगरमित्र नयन*

48. We were not favourably impressed with the competence of the subordinate staff for the work expected of them. We consider that a radical change in the recruitment of the permanent staff or such of them as occupy technical posts, is very necessary. Our recommendation regarding short-term engagements for technical staff applies with particular force to this Institute.

Rural Reconstruction Work.

49. In our inquiries evidence was tendered before us at a number of centres including Cawnpore of the activities of the Institutes in connection with preparing men to undertake rural reconstruction work. This is a feature of the Institutes which we do not feel competent to touch upon, as not being germane to the purpose of the specific inquiry entrusted to us, namely, to suggest measures for the greater effectiveness of the instruction imparted in these institutes.

Central Weaving Institute. Benares

50. We consider that a two years course more intensive than at

present as a result of our recommendations regarding the working hours and days is more than ample for training handloom weavers. Although the course proper will only be for two years, we provide for one year's additional advanced instruction to students of approved merit in Benarsi and other work. The advanced instruction is to be available only to a very limited number, say, for about six candidates. Some members of the Advisory Committee suggested that evening classes for men already in the trade to give instruction in card cutting, designing, etc. should be started. We attach very great value to the Institute insisting on faultless work from the very beginning and we contemplate that the award of a diploma shall rest on the completion of a specified quantity and standard of work performed under fully competitive conditions.

51. Admission for training at the Institute will be restricted to pupils who have had some preliminary training in other Government primary or aided weaving schools, the junior class of the Institute being confined to local residents only. Although we have recommended the abolition of the distinction between the artisan and non-artisan class courses, we wish that in admitting pupils to the Institute, preference should be given to those belonging to weaver castes and even among them to literates.

52. As stated already, we do not recommend the continuance of the system of stipends. Wages should be paid to pupils on the basis of practical work done. We suggest that practical work should take the form of marketable goods and that all earnings be handed over to the pupil. We feel that the incentive to good work this will provide will be a valuable factor in the training.

53. The Institute has been doing some good work in preparing and supplying designs for the trade and in evolving improved methods and appliances and labour-saving contrivances. Good designs form the basis of all artistic and successful craft work and we feel that in this matter unlettered handloom weavers should continue to be assisted by the Institute in even greater degree. Mythological, historical and artistic designs could be made much greater use of in the trade and we consider that the Institute should undertake the preparation of these, lithograph them to the full size and make prints available to the trade at a nominal charge. We understand that no designer is attached to the Benares Institute. We think that the appointment of a designer is necessary in Benares both for the industry and the handloom weavers.

54. We do not consider it necessary to provide for a teachers training class in this Institute as we think that the two years' intensive course will be adequate for training men to the required standard. Teaching diplomas may be given to such of the passed students as have read up to the vernacular middle standard.

55. Considering the importance of the handloom weaving industry we recommend that pupils on the completion of their courses should visit Mau and Tanda which are important centres of the handloom industry, to enable them to familiarize themselves with the actual conditions of the trade.

56. We have suggested a composite course of two years. We have not indicated what the syllabus should be as we do not consider it necessary to do so and we suggest that it be left to the Principal to determine how long each subject is to be taught.

57. It was stated that accommodation in the hostel attached to the Institute was inadequate but we consider that if three pupils are housed in each room, which can be done without inconvenience instead of two at present, the difficulty will have been solved.

58. Owing to the reduction in the duration of the courses, we consider that there is no need for augmenting the staff. In the modified conditions there would be scope for utilizing the services of the staff who owing to the reduction of the course will have less work than formerly.

59. We were also told that the workshops get uncomfortably hot in the summer. We agree that this should be remedied and we suggest that alterations be made to the sheds which would afford more ventilation at the top and sides.

60. We recommend that the working of the Institute, with the modifications, which we have suggested if they are acceptable to Government, be reviewed at the end of five years.

Carpentry School, Allahabad

61. Our proposals made elsewhere in this report for an increase in the number of hours per week and in the number of working days in the year would render possible the reduction of the course or the accommodation in the general course of such subjects as painting, polishing, upholstery, etc. which are now treated as separate courses. If this accommodation cannot be accomplished these subjects should, we consider, be taken up at evening classes for such of the men as may want them and that they should not cover separate courses of instruction in addition to the general and advanced courses.

62. We observe that in this Institute the duration of the course is six years while in Bareilly the same course occupies only five years. We consider that the course in this Institute should fall into line with that in Bareilly and not take a longer time.

63. We recommend that the Teachers' Training Course in Allahabad be abolished and that it be retained only in Bareilly. We see no need for this duplication.

64. The revised syllabus which we recommend for this Institute

has been prepared by a sub-committee of ourselves and the studies and courses as framed by them have our entire approval. We would also suggest that instruction in vaneing, decorative and other complicated furniture work, be undertaken at Bareilly only.

65. We would point out that in this Institution not even one member of the subordinate staff is a person who has had any experience in a commercial undertaking. The competence of such a staff to train men who on the completion of their course are expected to work under competitive conditions may well be imagined. We recommend that in future no teacher should ordinarily be appointed to the staff who has not had commercial experience.

66. We therefore suggest that in this Institution one Chinese carpenter at least be introduced in the staff. The criticism that may possibly have to be met is that it is not easy to obtain a man who can also teach. But we do not consider that it would be very difficult to give the selected man some training which would enable him to teach.

67. The importance of preparing designs and making them available to the trade at a nominal charge applies also to this Institute. This function should not be lost sight of; on the other hand it should receive greater attention to be of more assistance to the trade.

68. Students at the Allahabad Institute, living in the hostel attached thereto, requested the provision of a cook at Government cost, a facility formerly given to them but lately withdrawn. We consider the request to be reasonable and justified as we feel that students after their work at the Institute could hardly be expected to cook their own food; the expense of maintaining a cook privately or jointly is beyond the means of the pupils. We would therefore recommend that a cook be attached to the hostel at Government expense.

69. We consider that this Institute should be subordinate to the Bareilly Institute, the Principal of the latter being made responsible for the supervision and inspection of the working of the Institute. We consider that this co-ordination between the two institutes would conduce greatly to the utility and function of the institutions. We feel that a closer liaison between them is extremely desirable and the Institute would benefit from such co-operation.

70. We were favourably impressed with the Institute. The discipline is good and we consider that the changes we have proposed will, if adopted make the Institution more useful to the industry and the students.

The Central Woodworking Institute, Bareilly

71. Of all the institutions which came within our review, the Bareilly Institute was certainly the best. We found it conducted with an efficiency and capability which we should very much have liked to have seen

in the other institutions. The credit for the high standard of the institution goes primarily to the Principal who has had the benefit of having worked in a business concern.

72. Our remarks in paragraph 61 apply to this institution also.

73. The subordinate staff even in this institute is not all that we desire to see; it is without factory or commercial experience, almost all of them being ex-students of one or the other of the carpentry schools. We should like to see introduced in the staff one or two Chinese carpenters. Not only is the subordinate staff not fully competent but they are paid out of all proportion to their worth. For instance, we found a Cabinet Instructor getting a salary of Rs. 400 and a Seasoning Expert at almost a like salary, which we consider thoroughly extravagant and undeserved. We recommend that seasoning be done for the trade and that a fee be charged for the service. If the department cannot be placed on a self-supporting basis in this manner, it should be abolished.

74. The Bareilly Institute appears to have done useful work in the direction of preparing designs and making them available to the trade and we are confident that this activity will be continued with greater utility to the trade. We should also like to compliment the Principal on his introducing into the training subjects like toy-making, basket-ware, etc.

75. We recommend the employment of a cook in the hostel attached to this institution also. The reasons which we have adduced in this connexion in respect of the Allahabad School hold good here also.

Technical Institute, Lucknow

76. We consider that this Institute has not been catering for the demand and the only way in which this institution and the one in Gorakhpur could, in our view, serve the requirements of industry and at the same time enable the pupils to profit by the training, lies in converting it into a workshop entirely on commercial lines. We suggest that a committee of businessmen with one Government nominated member be appointed to manage the workshop. For a time, we envisage underwriting by Government to an extent which will not exceed what the institution now costs Government. Boys to be trained will be engaged as ordinary workers. For the first month or so they will familiarize themselves with the nature of the work and thereafter they will be paid wages at the appropriate market rate. The system we recommend is the Sandwich System as in operation in Jhansi where a period of three months spent in learning theory is followed by a nine months' training in the works. There will be a number of courses such as for fitters, turners, and machinists, moulders and smiths, welders, pattern-makers, etc. The minimum qualification for admission will be the 8th standard. Any person who has passed the Matriculation examination in Science subjects and who has successfully completed not less than two of the above courses (which

should invariably include fitting and turning) will be eligible for admission to the Engineering course of two years. Mechanical and Electrical Engineering courses will be separate but a student can take both of them if he wishes. We consider that for the Mechanics' course the number of admissions each year should be about 30 and for the Engineering course about ten. In the Mechanics' course the choice of the department will be left to the workers and as soon as a boy has attained a high enough standard to deserve a diploma or certificate he will be asked by the Principal to leave that department and move on to another of the pupil's choice. The boy will thus have, if he so wishes, opportunity to be trained in all the departments. The Principal will have powers to discharge such of the boys as do not promise to become efficient or competent workers and students electing to undergo not more than one course will be at liberty to do so. There will thus be opportunity to learn all mechanical subjects.

77. Instruction of an advanced type will also be available in the evening classes for such of the workers as care for it. Incidentally this reorganization would solve the difficulty referred to by a number of witnesses, the difficulty of placing apprentices with the industry for practical training. Under the scheme we propound this does not arise at all and the further question of getting suitable jobs for trained men will also become less troublesome as we think that after this training and with the degree of efficiency and skill of the worker after the theoretical and practical instruction they would fit the requirements of industry better.

78. The aim of the institution will primarily be to train boys to be general mechanics. For those who aspire to become engineers, instruction will be available in the evening classes. This will save the burdening of the syllabus for the sake of only a few who go in for advanced training. Provided a degree of efficiency is reached by the boy in a particular department the worker will himself decide to what other departments and when he will change. Boys who are engaged as workmen will only be recruited from those who have passed, say, the vernacular middle. The general training will be for the mechanics' standard. We consider that the standard now aimed at, with pupils who have not passed even the Matriculation, does not enable them to fully absorb and benefit by the training, as for an engineer's standard a more advanced background is necessary.

79. Given adequate Government patronage by entrusting these workshops with their own work, the district boards' local boards' and municipalities' work, there will be an ample field for these institutions to become self-supporting eventually and be independent of Government aid. The Institute as reorganized will, we consider, be in a better position to undertake also manufacturing work.

80. We recommend the continuance of the Light Mechanics' course

but suggest that, after a period of three years, the working of the whole Institute be reviewed to appraise the value and adequacy of the modifications we have proposed. We also consider that the Motor Mechanics course should be revived in Lucknow.

Technical Institute, Gorakhpur

81. We regret to have to say that this institution gave us profound disappointment. We suggest that the Institute be reorganized on the same lines as at Lucknow but that the aim of the Institute be confined to training general mechanics only. This applies also to electrical department.

82. Work for this Institute will, as in the case of the Lucknow workshop, be provided by Government departments and local authorities and by the industry and the bazar. Manufacture of light machines at present imported may also be undertaken at this as well as the Lucknow workshops.

SHRI RAM.
PADAMAPAT.
R. C. SRIVASTAVA.
M. ABDUR RAZZAQUE ANSARI.
JUGAL KISHORE.
BALKRISHNA SHARMA.



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APPENDIX I

GOVERNMENT CENTRAL TEXTILE INSTITUTE, CAWNPORE

History

The Government Central Textile Institute, Cawnpore, was formed in 1937, by amalgamating the former Government Textile School and the Dyeing and Printing School in accordance with the recommendations of the Industries Reorganization Committee and the Industrial School Committee. Both the Schools were located in the same building in Cawnpore.

The Government Textile School, Cawnpore, was established in 1923 when a corresponding class, which had existed at the Thompson Civil Engineering College, Roorkee, since 1906, was closed. The former Government School of Dyeing and Printing had its origin in a small class, which was started in 1914, for helping young men, preferably those connected with the dyeing industry, to acquire a rudimentary knowledge of the principles and practices of dyeing. On the recommendation of the Board of Industries this class was converted into a permanent school of dyeing and printing in 1917 and a full-time Principal was appointed in 1919.

The present Institute has two departments:

- (1) General Textile Technology comprising carding, spinning and power loom weaving, and
- (2) Chemical Technology of Textiles comprising dyeing, bleaching, printing and finishing.

Each department is under its own head, the head of the Chemical Technology section being also the Principal of the Institute.

Aims and Objects

The general textile technology section aims at training men for junior supervisory posts in cotton mills. The part-time apprenticeship course is intended for men already employed in the mills, whilst the part-time artisan course provides training in the vernaculars for mill operatives. In the Chemical Technology section, the Diploma course provides training of the same standard as in the Textile Technology section and aims at producing men suitable for junior supervisory posts. The artisan course in this section is not a part-time course but is intended to train men who will become artisans later on. There are also peripatetic and tuitional classes conducted by this section.

Courses of Study

The present courses consist of the following :

(1) *General Textile Technology*—This section has the following Courses :

(a) *Diploma Course*—Three years at the Institute followed by one year's apprenticeship at the mills.

Admission qualification—High School Examination or equivalent qualification.

Number admitted in each year—Ten.

Students have to specialise in either (i) cotton carding and spinning, or (ii) Textile manufacture (power loom weaving including elementary knowledge of handloom weaving).

(b) *Part-time Apprentice course*—Two years at the Institute.

Admission qualification—Should have studied up to 10th standard.

Number admitted in each year—Ten.

(c) *Part-time Artisan Course*—One term of five months.

Admission qualification—Candidate should be actively engaged in the industry and recommended by the mill in which they are working. They should be able to read and write Urdu and Hindi.

Number admitted each year—Five.

(2) *Chemical Technology of Textile*—

(a) *Diploma Course*—Three years at the Institute followed by one year apprenticeship.

Admission qualification, and } As for Textile Technology
Number to be admitted. } section.

(b) *Artisan Course*—Two years at the Institute.

Admission qualification—Candidates should be able to read and write Urdu or Hindi and should preferably be engaged in or connected with the dyeing or printing industry.

Number admitted each year—Ten.

Courses for specific subjects are also arranged. In addition to the above courses of instruction, the peripatetic and tuitional classes impart instruction to the cottage workers of the Province at their homes.

Recommendations

In regard to the General Textile Technology section, the Committee's recommendations may be summarized as follows :

(1) The Diploma course should be of 4 years' duration as at present.

(2) In the first year the first six months should be devoted to instruction of an elementary type at the Institute in general mechanical subjects, such as, fitting, turning, etc., and in spinning and weaving. The remaining period of about 150 working days should be spent in a textile mill on apprenticeship training.

(3) The second and third years are to be spent at the Institute. During this period special attention is to be paid to work of a practical nature such as dismantling and re-erecting machines, at least once for each machine ; instruction in theory is to be accompanied by demonstration in the workshops ; a smaller part of the time is to be devoted to theoretical instruction and a multiplicity of subjects is to be avoided ; and finally a system is to be evolved which will render home preparation unnecessary.

(4) The fourth year is to be spent on apprenticeship training in a textile mill.

In order to give effect to the above recommendations the following changes in the courses of instruction are proposed :

(1) All pure science subjects such as chemistry, physics and mathematics should be eliminated from the instruction of the Institute. The admission qualification should be raised from High School certificate to the Intermediate Science or the B. Sc. degree. Students with such qualifications will know sufficient of pure science and mathematics to be able to follow the technical instruction in the Institute without being taught these subjects at the Institute. For men employed in the mills who are proposed to be admitted with lesser academic qualifications, tuitional classes may be arranged in science where necessary.

(2) Since the amalgamation of the Textile School and the Dyeing School into the present Institute too many "common" subjects have been introduced which are taken by students of the Textile Technology and the Chemical Technology sections both. Such common classes are convenient for the staff but may prove wasteful for the students' time if the common subjects are not of equal importance to both the sections. It is proposed that the common" subjects should be reduced to an absolute minimum.

An outline of the courses is given below :

I. *Textile Technology section*—Instead of the present three courses, it is proposed to have only two courses as follows :

(1) Diploma Course—

(a) Admission qualification—I. Sc. preference being given to B. Sc.

(b) Number to be admitted—Fifteen every year.

(c) Duration of Courses—Four years including one year spent on apprenticeship at mills.

Note—Exemption—Students who have been actively engaged in cotton mills for at least two years in carding, spinning, weaving or engineering departments and who have passed the High School examination in Science will be eligible for admission and will be exempted from the first year's training. The effect of this exemption will be that the men coming directly from the mills will receive a preferential treatment both in regard to admission qualification and the duration of training and larger number of candidates may be expected to come through the mills. The present part-time apprentice course has not been a success and the arrangement now proposed will ensure a better type of training.

(2) Artisan Course—

(a) Admission qualification :

(i) Candidate should be able to read and write Hindi or Urdu, preference being given to those possessing somewhat higher educational qualifications.

(ii) The course is meant exclusively for men who are actively engaged in the industry and are recommended by the mills in which they are working.

(b) Number to be admitted—Twenty.

(c) Duration of course—Five months.

Note—No provision is made in the present part-time Artisan course for any theoretical instruction. It is proposed that elementary theory should now be included in a tuitional form, instruction being given in one of the vernaculars whilst the students are working in the workshops.

II. *Chemical Technology*—The Committee's recommendations in regard to the Chemical Technology section are summarized below :

(1) The demand for dyers is very limited being only about 2 per year for the entire Province and for even these posts men with a better training, such as that given in the Bombay University Textile Chemistry Department are preferred.

(2) The training given in this Institute should therefore be intended—

- (a) to equip men to fill junior posts in mill, or
- (b) prepare them to start their own dyeing and printing business,
- (c) to train them to teach improved methods to village workers.

In view of these recommendations there appears to be no room for the present Diploma course in Chemical Technology.

There is an Artisan course of two years' duration in the Chemical Technology section. Unlike the apprenticeship course of the Textile Technology section, the Artisan course of the Chemical Technology section is a whole-time course. It is not intended for artisans, as the name appears to indicate, but is meant for turning out men who will become artisan dyers and printers. This course is said to be for turning out men who will work in the village or in the bazars as dyers and printers. In view of the Committee's recommendations the number of students admitted to the Diploma course should be strictly restricted. The training given should also be made more practical and theory should be reduced to a minimum, all abstruse and purely scientific branches of chemical technology being eliminated.

There will then be the following courses in the Chemical Technology section of this Institute :

- (1) *Diploma Course*—This will have two sections:
 - (a) For training men to fill junior posts in mills.
 - (b) For those who are to teach improved methods to cottage workers.

The educational qualification for admission to this course should be the High School examination with distinction in Chemistry and Physics.

In the training for this course also, the qualification of 150 working days in a mill should apply, if it can be arranged, but if it cannot be done, such training may be given in the Institute itself. The theoretical and practical course in the Institute should be of two years' duration with a vocational course of two months in between to be spent in some textile mill after the end of the first year. After completing this course there should be a mill training for 300 working days during which time the candidates should go through all sections in the department. As far as possible an arrangement should be arrived at with leading finishing mills (those who have got elaborate dyeing, bleaching and finishing equipment) for admitting these boys for training. Two reports of all the work done in the mills should be submitted at the end of 150 working

days. These reports should not be of less than 20 pages each. It is extremely desirable that the Institute should undertake to arrange for mill training.

In case of students who want to qualify for the course no. (1) (b), the admission qualifications and the duration of the training in the Institute should remain the same. But instead of 300 working days training in the mills, 150 days for the mill training to acquaint them in the technique of large-scale production should be prescribed. After this six months' training a further practical training for 150 days should be imparted at the Institute for cottage industry work as well as research work in investigating newer methods for cottage industry, with special reference to application of indigenous dyes to textiles.

The total duration of the training will be about $3\frac{1}{2}$ years.

(2) *Artisan Course*—Artisan classes for those who want to start their own dyeing and printing business. These classes are to be held in the vernacular. The admission qualification must be as far as possible vernacular middle in Hindi or Urdu. The course must be on the same lines as at present. They should be trained in laundry work just as the diploma students.

The above course is not a course in the regular sense of the term. It is only to give some useful training to artisan dyers and printers so that they could work for their own shops with improved methods and understanding. We have therefore not prescribed any detailed course for the same. Suitable training in vernacular may be given to those who are already in the trade, and want to learn scientific methods. As a matter of fact even persons who have had training under course no. 1 may be encouraged through Government help to start their own small business if they so desire. There seems to be ample room for such business in order to help handloom weavers.

Revised syllabuses

Detailed syllabuses for the Textile Technology and Chemical Technology sections are given in Annexures I and II respectively.

General Remarks

1. It will be desirable if a series of periodical lectures by the carding, spinning, weaving, dyeing, bleaching, printing and finishing experts actually in employment of various mills is arranged every year; also the practice of visiting mills periodically should be encouraged.

2. All the subjects should be taught from the practical point of view as far as possible. Individual students should be encouraged to take special interest and specialize in one of the subjects.

3. The system of examinations, not only for this Institute, but for others also, requires looking into. It appears that in order to save the fees of outside examiners the final examination is conducted only in those subjects which have been taught in the last year. Obviously this can only be regarded as a partial test and not sufficient for granting the Department's diploma.

4. The staff of this Institute is of a poor standard and entirely lacking in practical industrial experience. It has already been suggested by us that in future men should be recruited from the industry on short-term contracts. This is satisfactory so far as new entrants are concerned, but something has to be done to improve the quality of the existing staff also. For this purpose it is suggested that the department should fix efficiency bars in the grades of salaries of the staff and one of the conditions for crossing each efficiency bar should be that the officer concerned has kept his knowledge and experience up to date by undergoing specialized training or acquiring factory experience during vacations and periods of study leave. Those members of the staff who are due to retire in the near future should be warned that if they do not improve themselves they are liable to be retired compulsorily.

5. Under the present system of examinations no marks are given for the practical work which students do in the workshop or mills although this constitutes the most important side of their training. A comprehensive scheme of class work and practical work marks combined with the examination marks should be drawn up so that due credit is given for the entire work done by the student from the time he enters the Institute up to the time he finishes his final year apprenticeship.

Annexure to Appendix I

SYLLABUS FOR TEXTILE TECHNOLOGY SECTION OF THE TEXTILE INSTITUTE, CAWNPORE

The accompanying syllabus has been prepared on the basis of the following combinations of subjects for the final diploma examination of Textile Technology:

Group—I

- (a) Cotton spinning I, II and III (papers).
- (b) Weaving general.
- (c) Textile Technology.

Group II—

- (a) Weaving, I, II and III (papers).
- (b) Spinning general.
- (c) Textile Technology.

Group III—

- (a) Weaving I, II and III.
- (b) Hosiery manufacture (more practical).
- (c) Designing (.....).

First Year

Spinning Lectures—The general characteristics of the chief varieties of cotton ginning and baling. The commercial purpose of mixing cotton. The general principles of cotton carding and spinning including the elements of opening, cleaning and scutching.

Brief description of the machines and processes aiming to the cotton opening, carding and spinning. Function of the machines in which cotton is processed from the raw state to beaming.

Weaving—Preparation and weaving mechanism :

A brief introduction of the commonest preparatory processes for grey and coloured warps.

The primary motions and mechanism of plain loom.

Fabric structure and textile quantities :

Construction of standard weaves including plain, twills, satins and their derivatives.

System of counting cotton yarns, reeds and healds. Analysis of the cloth of the course for count of yarns, reeds and picks per inch.

Engineering : Geometrical Drawing—Plane geometry ; use and care of drawing instruments. Proportional division of a line. Construction and use of plain and diagonal scales. Construction of triangles, polygons, circles, tangents, chords, inscribed and escribed polygons and circles. Construction of parabola, ellipse and hyperbola.

Solid geometry ; principles of projection and definitions of terms. Projection of points and lines. Planes : their traces and inclinations. Projection of solids, such as cubes, cylinders, and cones placed in simple positions. Plane sections of solids, simple cases of intersection and development of surfaces and interpenetration of solids.

Orthogonal, oblique and isometric projection of solid and hollow bodies. Practical problems.

Electro-Technics—Elementary theory of A. C. and D. C. motors and Dynamo. Transformers, factory circuits and connections.

Descriptive Engineering—Generation of steam. Brief description of boilers. The reciprocating steam engine. Transmission of power from prime mover to machine.

Spinning Practice—Sketching of machines explained in lectures showing the principal parts, their name and passage of cotton, sliver, etc.

Demonstration of the working of the above machines and practice with a view to make the students familiar with them.

Weaving Practice—Sketching of the machines explained in lectures showing the principal parts, their name and passage of yarn.

Introduction and practice in the preparation of threads for winding.

Practical instruction in the handling and adjustment of hand and powerlooms. Study of loom mechanisms for shedding, picking, beating up, weft fork stop motion, brake and let off motion.

Engineering workshop—Carpentry, General use of woodworking tools, sawing, cross-cutting, planing, jointing, pinning, nailing, screwing and making simple joints and their application.

Smithy. Forging round—and square—bars from scrape pieces. Making small forgings such as keys, links, etc.

Turning—of elementary nature.

Fitting work—Production of plane surface by hand methods. Use of hammer, chisel and file. Fitting parallel parts together. Making and fitting keys.

Books—

Spinning:

- (1) Cotton spinning, Volume 1, by W. S. Jaggart.
- (2) Cotton Spinning, Volume 1, by J. Thornley.

Weaving:

- (1) Mechanism of Weaving Designing, by Taylor.
- (2) Mechanism of Weaving, by W. Fox.

Machine Drawing:

- (1) First Year Engineering Drawing, by Parkinson.
- (2) Heat Engine, by Ripper.

Second Year

Spinning Lectures—Geographical position of the cotton fields of the world. Area within which cotton can be commercially cultivated. Physical conditions necessary to the growth of cotton and their influence upon the character of the fibres. The grading of cotton in relation to their values and spinning properties. The principles of pneumatic applied to the blowing-room machinery. Different systems of mixing cotton, Hopper bale-breakers, feeders, cotton conveyers, openers and scutchers.

The mode of operation of the various types of the cotton card. Details of card clothing, special features of flats, their support and setting. The need for stripping and grinding and the methods applied.

Effects of doubling and Drawing by rollers of draw frame and the setting of rollers for different types of cotton.

Attenuation, twisting, winding, and bobbin building.

The method of driving the ring frame and its parts. The mechanism for building bobbins.

Spinning calculations (for Group I students only):

Simple calculations on counts, speeds gearing, production and efficiency for the machines named above.

Weaving—Preparation and weaving mechanism—Study in detail of preparatory machines used most commonly in cotton industry, such as vertical grey warp-winding machines (mangle wheel and heat cane) drum winding and circular winding. High speed cheese or cone winder Weft rewinding high speed universal pirn winder. Beam and high speed warping. Slasher size.

Timing of the loom sections. Shedding by tappets and by dobbies; heald reversing motions. Alternative picking motion. Methods used to give an eccentric sley motion. Divert and indirect up take motions. Warp stop motions. Multiple shuttle box motions.

Fabric structure and textile quantities:

Ornamentation of plain fabric by introduction of colour and variation in quality particulars along the warp and weft. The structure of the following fabrics: Fancy twills, Towel weaves, extra warp and weft figuring, warp and weft backed fabrics, brocade, Damask, warp piles special loom equipment.

System of counting yarns besides cotton and conversion from one system to another. Calculation for weight of warp and weft from samples.

Analysis of the fabrics of the course.

Textile Chemistry—The chemistry of the textile fibres. Cleansing and bleaching. Principles of dyeing. Outline of dyeing and finishing machineries.

Design and Colour—(For students of Groups II and III only).

Preparation of sketches for stripped, checked, spotted and diapered fabrics to be woven on plain, tappets or dobby machines. Application of colour to designs for fabrics.

Textile Technology—Sources, properties and uses of textile raw materials. General characteristics of principal fibres. Varieties of each. Detailed consideration of the properties of cotton fibre.

Testing Laboratory—Testing of yarns for turns per inch and counts by various methods, determination of strength of yarns and fabrics.

Mill management and Industrial Organization—Brief principles of modern scientific management, Legislation affecting textile industries. Outlines of internal organization, departmental and functional organization selection of employees. Training: Graphical and Statistical study and control.

Engineering—Machine Drawing: Freehand sketching and preparation of drawings from models of simple mechanical details, such as bolts, nut, studs, set screws, flange couplings, cranks, connecting rod ends, bearing, pulleys with straight and curved arms, spanners, simple revetted joints, etc. Preparation of general arrangements from detailed drawings and of detailed drawings from general arrangements.

Preparation of complete drawings from examples of actual practice in shops, making drawings from rough dimensioned sketches.

Mechanics of Textile machinery: Epicyclic wheel trains differential motions. The winding mechanism of flyer frame, the mule, the ring frame, and of weft winding machines. Kinematics and dynamics of the power-loom. Motion of sley. Picking motions. Fly wheels Dynamo meters.

Spinning Practice :

Removing and resetting different machine parts. Demonstration of different settings and explanation of their results with special reference to their functions and effects on cotton. Testing of laps. Practice in adjusting the machines for different class of cotton and counts of yarn. Erection and line levelling of dismantled machines.

Weaving Practice :

Instructions and practice on warping machines. Lag pegging and baiting of power looms. Tinning and fixing of the various parts, tappets and dobbies, weaving practice.

Specimens—Each student taking either section II or III must produce the following specimen :

- (1) Stripped.
- (2) Checked,
- (3) Sari border of 40 shafts.
- (4) Towelling weaves.
- (5) One specimen of 100 s. or 200 s. jacquest.

Books—

Spinning—Cotton Spinning, Volumes II and III, by Jaggart :

Advanced Cotton Spinning, by Thornley.

Preparation—Preliminary operation, by Nisbet.

Weaving—Advanced Design, by Watson.

Designing—Textile Design, Pure and Applied, by Woodhouse and Milne.

*Third Year**Spinning Lectures—(For students of Group I only):*

Methods of selecting cotton and the types and count of yarn for which each is suitable. Defects in cotton. Precaution to be taken against the dangerous effects of faulty ginning, baling and packing. Cotton blow room problems. Critical study of drafting and roller settings. Principles and objects of mule spinning. Methods of driving the rollers during outward and inward runs of the carriage. Details of Backing Off, winding on and shaping of cops. Click and Click wheel. Arrangements for various purposes. Theory of winding mechanisms, twisting at the head. Mechanism of mule.

Methods of conditioning, packing and transport of cotton yarns. The various types of single cotton and staple rayon yarns and the uses to which they are put.

The nature, quality and quantity of waste made by each machine and the subsequent treatment of the various wastes for the spinning machines and the machines used for spinning waste into yarns.

Mechanism of speed frames. Application of high draft system to fly frames and ring frames. Application of variable speed spinning and doubling. A detailed study of the separate mechanism and their synchronised arrangements in each of the machines used in a cotton spinning mill. Defective work from the machines its effects, causes and remedies.

Theory of doubling, construction of the various types of machines used. Arrangement of creels, troughs, building motions. The objects of doubling two or more ends together and the effects of varying counts of and direction of twist.

The machines for reeling cotton yarn; the different forms in which yarn is reeled, bundling and other methods of making up.

The production of fancy yarns and the characteristics required counts and twisting of such yarns.

Selection of machinery necessary for opening coarse, medium and fine counts. Alterations of all machines for special purposes. Specifications and planning of machinery, output, costing and testing for different classes of cotton. Principles underlying material and adjustment of machines.

Spinning calculations—(For students of Group I only):

All calculations likely to arise in practice such as total and intermediate drafts, speeds of different parts of each machine. Twist wheels, change wheel for drafts, gain wheels, builder and rack wheels, speed wheels, twist per inch, indicators, wages at each process and mill planning. Systems of yarn counting conversion of counts, folding of yarns, resultant counts, and average counts.

Advanced calculations on the driving of and the production and efficiency of the machines.

Preparation and weaving mechanism—(For students of Groups II and III only):

Air drying sizing machines, hanksizing, Ball warp sizing and Yorkshire dressing.

Preparation of material other than cotton.

Outlines of Jute and silk weaving and conversion of plain loom for silk weaving. Principal features of real silk looms.

Production of preparatory and weaving machinery. The selection of the most economical machinery and processes for the production of different types of cloth. Estimation of weaving shed efficiencies. Weaving mill planning. Wages.

Merit and demerit of handloom weaving and automatic weaving.

Finishing—(For students of Groups II and III only):

A general survey of various types of finishing and their machineries. Properties of sizing and finishing material. Detail study of grey finishing and warehouse equipment. Folding, making up and Baling of finished goods.

Textile Technology—(For students of Groups I and II only):

The construction and use of standard testing instruments. Appliances used for special tests. Testing method. Sampling fibre strength. The influence of twist, count and regularity on the physical properties of cotton yarn. The influence of structure on the physical properties of cotton cloth. Quality in fibres, yarns and fabrics.

Testing: Microscopic examination of various textile fibres and the identification of normal, abnormal and thin walled cotton hairs. Sloping by hand and mechanical (i. e. Bear and Ball methods).

The use of testing instruments and the interpretation of the results obtained. Testing of fabrics for the quality of materials used in their construction. Quantitative and qualitative analysis of mixed yarns and fabrics.

Design and colours—(For students of Group III only):

Systematic study of different colour theories. Harmonics, contrast gradation, shading, etc.

Colour schemes for definite purposes such as Ladies Dress fabrics, Men's dress fabrics and furnishing fabrics.

The planning of such types of pattern as geometric, interlacing scale counter change, interchange, scrole, floral, etc.

The treatment of units of design by horizontal repetition, stepping and the various satin and other bases.

The preparation of point paper designs for brocade, damask, furnishing fabrics and fancy and novelty cloths suitable for weaving on dobbies and Jacquard with or without multiple boxes.

Hosiery manufacture. (For students of Group III only):

Plain knitted fabrics—The nature, uses and classification of different types of knitted fabrics.

Practice in bleaching, dyeing and finishing of knitted fabrics.

Production of plain knitted fabrics. Practice in bleaching, dyeing and finishing knitted fabrics.

Engineering—(For students of Groups I and II only):

Textile mill engineering: Selection of site for a textile factory.

Layout of the buildings and machinery for different classes of work.

Lighting, heating and ventilating and humidifying of weaving sheds.

Driving system for the machinery. Power consumed by each machinery. Cost of power and lighting. Lubrication, prevention against fire and accidents.

Spinning Practice—Erection of the machines and practice in adjusting the parts of the machine for different classes of cotton and counts of yarn. Testing of silver, roving and yarn in order to determine the difference between the actual and the calculated results. Measurement of speed of different parts and determination of the difference between the actual and calculated results.

Weaving Practice—Instruction and practice in sizing (for this department further sum is being provided in the extension scheme). Timing and fixing of box motions, Terry motions, cross-border dobbies.

Students of Group III will have to submit the following:

- (1) Two specimen showing the use of fancy yarns.
- (2) Two dobby samples.
- (2) One silk damask.
- (4) Three fabrics of complex textures.
- (5) Two furnishing fabrics.

Applied design—(For students of Group III only):

Principles of jacquard machine. Arrangements of jacquard and harness for simple work; single lift machines; open sheet devices; methods of tying harness; connections to hooks and needles.

Arrangement of cords in the coomber board, consideration of height, width, twine, knots, mails, binges, dressing, types of coomber boards, jacquard designs, relation of ends in design and sett of harness, casting out. Special forms of harness for double cloths.

Books—

Spinning :

Advanced cotton spinning, by T. Thornley.

Spinning Calculations, by T. Thornley.

Weaving :

Jacquard mechanism and Harness Mounting, by F. Bradbury,
Calculations in yarns and fabrics, by F. Bradbury.

Pattern Book.

ANNEXURE II TO APPENDIX I

SYLLABUS FOR THE CHEMICAL TECHNOLOGY SECTION OF THE GOVERNMENT
CENTRAL TEXTILE INSTITUTE, CAWNPORE

1. *Technology of Bleaching and Mercerising*

Historical, principles of bleaching cotton yarn and cloth, art-silk, wool and natural silk fabrics. Principles and practice of singeing, desizing, kier boiling, chemicking, scouring, scutching, water mangling, etc. Preparation of bleach liquors, kier lyes ; bleaching of plain and striped goods, chlorine bleach, hydrogen peroxide bleach. Description of Bleach House machinery and its progress. General arrangement of machinery. Various methods of scouring, pressure boils, tight washing and slack washing. Principles of mercerising of cotton yarn and cloth. Various types of yarn mercerising machines. Chainless and chain types piece mercerising machines. Dissolving of caustic soda, preparation of caustic lyes, cooling methods, recovery of caustic lye, etc. Textile auxiliaries and their uses in bleaching and mercerising. Faults and stains produced in bleaching and their removal. Causes of damage to fabrics in bleaching.

2. *Technology of Dyeing*

Historical. Application of acid, basic, direct, mordant, vegetable, mineral, naphthols, vat and special dyes for cotton, art-silk, wool, natural silk and other textile fibres with special reference to cotton, wool and natural silk. Methods of dyeing fibres in loose, hank, cheese, beam, cops, funner, jigger and padding dyeing. After treatments for improving fastness. Identification and evaluation by dyeing of various colours of all classes.

3. *Technology of Textile fibres*

Sources, properties and uses of textile raw materials, with special reference to cotton. General characteristics of principal varieties of each. The construction and use of standard testing instruments. Appliances used for special tests. Testing methods. Detailed consideration of the properties.

of the cotton fibre and the effects on it of various treatments. Fibre strength and yarn strength. The influence of twist, count and regularity on the physical properties of cotton cloth. Quality in fibres, yarns and fabrics. Microscopic examination of textile fibres, methods for identification of textile fibres.

4. *Textile Engineering*

Principles and practice of erection of machinery. General repairs. Steam pipes, water pipes, and valves leakages. Description of valve construction. Pressure gauges, safety valves, etc. Proper care and running of machines.

Materials of construction used in a dye and Bleach House. General planning of light and ventilation, lubrication, cleaning of machinery, shafts and pulleys, gear boxes, belt and rope drives, individual electric drive and couplings, etc. ball bearings, roller bearings, and their advantages and uses in various machines.

Safety devices. Causes and prevention of accidents and first-aid.

Sketching of all bleaching, mercerising, dyeing, printing, and finishing machinery. General knowledge of plan and elevation of all Dye-House machinery to enable to read blue prints. (This subject is to be taught from purely practical point of view).

5. *Testing of principal textile materials*

General principles of inorganic chemistry. Testing and analysis of caustic soda, soda ash, hydrochloric acid, sulphuric acid, oxalic acid, acetic acid, bleaching liquors, hydrogen peroxide etc. and other important chemicals used in various processes. Microscopic examination of various starches. Modified starches. Water and its impurities. Importance of soft water. Water softening processes. Some idea about auxiliaries.

6. *Technology of Textile Finishing*

Principles of sizing, materials used in sizing and their properties with special reference to bleaching. Art of finishing, various types of finishes on different fabrics. Uses of starch, modified starches, dextrines, gums, softeners, glazing agents, and weighing agents. Special finishes. Auxiliaries and their uses. Drying machines, stenters and calenders.

7. *Technology of Textile Printing*

Historical. Principles of printing, methods of printing-block, screen, spray, blotch and roller calico printing. Preparation of the goods for printing. Thickening agents and auxiliaries. Preparation of printing mixtures. Styles of printing. Common defects in printing. Steaming, soaping, and clearing processes. Description of printing machinery. General idea of

designs used in printing. Roller engraving. Colour combinations and decoration effects. Elements and principles of ornament, patterns and styles.

8. Costing and Store Management

General methods of determining cost of production of various processes. Arrangement and management of stores. Prevention of shortages and excesses in stocks.

9. Laundry Work

Dry cleaning, garment dyeing, damping, pressing, starching, shrinking, glazing, etc. Description and causes of various stains on cotton, wool and silk garments. Removal of various stains.

GENERAL TIME-TABLE

Subject	Theory		Number of lectures of 1 hour's duration	
			1st year	2nd year
Technology of bleaching and mercerising	60	...
Technology of dyeing	40	40
Technology of textile fibres	40	...
Technology of printing	60
Technology of finishing	30
Textile engineering	40	...
Testing of principal textile materials	30	30
Costing and stores management	15
Laundry work	15
Total			210	190

Practical

Subject	Number of days (of 6 working hours per week)	
	1st year	2nd year
Experimental... ..	1	...
Bleaching and mercerising experimental dyeing ...	2	2 in first session.
Testing and analysis of textile fibres	1	...
Experimental printing ... ..	...	1
Experimental finishing ... ..	...	1
Workshop practice	1 2	...
Testing of principal textile materials	1	1
Laundry ... ..	...	1 in second session.

Mill Training

Two months' training at the end of the 1st year and 300 working days at the end of the second year.

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APPENDIX II

GOVERNMENT CARPENTRY SCHOOL, ALLAHABAD

Origin and Objects

The school was opened on April 1, 1918, in order to provide facilities for training in carpentry in addition to those provided by the Central Wood-working Institute, Bareilly. The aim of the school was to undertake the training of artisans of hereditary type and to provide opportunities for the training and employment of educated youths of the Province. Allahabad was selected as it was believed to have a good scope for further development and for catering the needs of the wood-working trade of the Province south of Lucknow.

The school gives training in furniture-making and other wood-work by hand methods, as distinct from machine methods which are taught at Bareilly. The school trains students intended for being employed as mistris foremen, supervisors, polishers, painters, upholsterers and house furnishers; also teachers in wood-work for which a specialised training is given.

Courses of study

The following table gives various courses of instruction provided at the school, their duration, and the minimum qualifications for admission:

Name of section or course	Duration of course (years)	Minimum qualifications for admission
1. Artizan's course	2	No educational qualifications are required, but students must have a practical knowledge of carpentry. Minimum qualification literacy preference is given to candidates who have studied up to High School standard.
2. Wood-working ... ..	...
(i) General wood-working class ...	3	
(ii) Advanced wood-working class	3	Admission is made on completion of Course, or proved capacity to undertake advanced study.
(iii) Teachers training class ...	2	Admission is made on selection from men who have completed and passed the advanced course.
3. Polishing and painting class ...	3	No educational qualifications are prescribed. Some knowledge of one of the vernacular.
4. Upholstery class	3	Ditto.

Admissions are made by an *ad hoc* committee consisting of the Principal and two members of the Advisory Committee appointed by the Director of Industries and Commerce. The minimum educational qualifications prescribed for admission to the General Wood-working course is literacy and preference is given to those who have studied up to the High School standard. Some of the artizans who do not possess the minimum educational qualifications and who have had previous training in wood-working are admitted to the artizan course. No age limit or educational qualification is prescribed. This course is primarily intended for those who desire to work as artizans. A limited number of successful candidates from the elementary course and artizan course are admitted to the Advanced course which extends over a period of three years. Advanced training in general wood-working is imparted in this course. Students who have completed the General or Advanced course at Allahabad or some other school or who can demonstrate their ability to take up the subjects within the period prescribed for this course, are eligible for admission to the Teachers Training course. Training in higher class of wood-working and design, varieties of timbers, their characteristics and methods of preservation, etc. is imparted. Although the main object of the course was to train students in higher technique of wood-working and also get them acquainted with the general methods of teaching yet the course has always served as a higher class for wood-working. No educational qualifications are prescribed for admission to the Painting and Polishing course, and Upholstery course which are primarily meant for the sons of those who are engaged in the trade.

Recommendations

In accordance with the recommendations of the Committee, the courses of study at the Carpentry Institute, Allahabad, have been modified and the following courses are now proposed for this Institute :

- (1) Elementary course in Cabinet-making and joinery—3 year.
- (2) Advanced course in cabinet making and joinery for those who have completed the Elementary course—2 years.
- (3) Wood Finishing and Painting courses—2 years.
- (4) Upholstery course—2 years.

Abridged prospectus and syllabus for this course have been drawn up by Mr. S. B. Naidu of the Bareilly Institute and are given in the Annexure.

It will be observed that the main carpentry courses at Allahabad have been reduced from 6 to 5 years, the same period as in Bareilly. The Foreman course has been abolished and retained only in Bareilly. In regard

to the Painting, Polishing, and Upholstery course, the Committee has recommended that this should be taken up at evening classes but it was felt that with the exception of the working hours it will be difficult for the students to find time for evening classes. Hence these subjects have been included in two courses of two years' duration each.

Abridged Syllabus of the Carpentry School, Allahabad

1. Elementary course in cabinet making and joinery—3 years.

Practical Work—

(1) Tools. Hand wood-working tools—Their construction cutting action, selection, maintenance and care. A kit of ordinary tools, its cost.

(2) Workshop equipment—Work benches, grip screws, steps, cramps, bench hooks, etc.

(3) Workshop Practice—Method of sharpening and setting saws, sawing, ripping, cross-cutting, tenoning and shouldering, planning, sharpening and setting irons, shooting and jointing, sticking, mouldings and beads, pinning, nailing, brading and screwing. Marking-out timber from full size drawings. Glues—their varieties, preparation, application and uses.

(4) Simple joints and their application.

(5) Construction and manufacture of simple articles of furniture involving the use of the above tools, appliances and workshop practice.

Simple Mouldings.

Cabinet fittings.

Carving courses. Simple tools and other appliances. Simple exercises in incised, pierced and raised carving as applied to furniture decoration and chip-carving.

Drawing and Designing—

(a) Free-hand drawing—Elementary exercises in free-hand drawing, geometrical and natural objects, reducing and enlarging.

(b) Perspective drawing—Isometric drawings of rectilinear solids and simple articles of furniture, Elementary linear representation of rectilinear solids and simple furniture.

(c) Geometrical Drawing—Definition of terms used in plane geometry dealing with lines and surface and construc-

tion of such easy and simple problems generally required in connection with the manufacture of cabinet work, pertaining to lines, etc.

(d) **Technical Drawing and Design**—Drawing to scale in plan section, elevation, etc. and full size details of simple articles of furniture. As detailed in paragraphs (4) and (5) and designing simple articles of furniture to a given specification.

Setting-out—Setting out in full size on workshop rods all articles of furniture made during the course of practical training as detailed in paragraph (5). **Marking-out.**

Quantity and Estimating.—The preparation of cutting out lists of material required for the exercises of practical course (paragraph 6).

Estimating cost of material, labour, overhead charges etc.

Theory—

(a) **Timber**—Growth, conversion, defects and disease, methods of seasoning, marketing forms and prices, varieties of provincial timbers, habitat, identification, uses.

(b) **Construction**—Properties and uses of tools.

(c) **Fundamentals**—Principals of furniture, construction of simple articles as detailed in paragraph 5.

2. Advanced course in Cabinet making and Joinery—2 years.

Practical Work—

(1) **Tools and appliances—**

(a) Special for advanced work—filister, chariot planes, etc.

(b) Machine tools—Elementary practice.

(2) **Workshop practice—**

(a) Use of advanced tools.

(b) **Roofs**—Methods of king post roof, queen post roof.

The couple roof and couple close roof.

(c) **Wood flooring.** Various flooring joints, single and block floors, partitions and wall panelling.

(3) **Joints and their application.**

(a) Advanced cabinet joints.

(b) Joiners joints.

(4) **Cabinet making**—Extension tables, gate-lagged tables, sideboards, dinner wagon, dressers, wardrobes, dressing tables,

bureau, elliptical tables, china cabinets, secretaire table, music cabinet, half sets, revolving book cases.

Cabinet mouldings, of the higher order.

Carving Course—More advanced exercises in incised, pierced, raised carvings as applied to furniture, under cutting, Indian geometrical, tracery pierced carvings, and artificial and conventional foliage and leaf. Making shaped cabriolè and claw foot legs, Jacobean twisting and styles and carved ornament.

Polishing—Preparation of the wood, staining, grain-filling, preparation of French polish, cost, application of ordinary articles of furniture.

Caning. Simple caning of furniture.

Drawing and Designs—

(a) Model Drawing.

(b) Perspective drawing—representation in linear perspective, sketches in furniture of advanced type forming the course when specification and drawings in orthographic projections are given.

(c) Geometrical Drawing—(Plain and solid)—The subject will be dealt with more comprehensively than what done by students of the Elementary course on problems pertaining to scales, construction of irregular polygons, semi-circular, stiled, segmental lancet arches, etc. usually required by a cabinet maker and carpenter.

(d) Technical drawing and design—

(i) Drawing in plane elevation and section to scale and full size details of important and difficult articles of furniture forming the practical course in cabinet making, including the various mechanical movements employed in furniture. Standard trusses of roofs, king post, queen post, couple and couple close. Simple doors and windows, both interior and exterior. Lay-out for flooring and flooring joints, etc. Designing the above to specification and photos.

(ii) Setting-out—Preparation of setting out rods in full size of all classes of furniture and fitments executed in the practical work of the advanced course and making patters for all classes of shaped work.

(iii) Quantity and Estimating—Preparation of cutting out lists of material required for all work undertaken in the practical class. Estimating the quantity and cost of articles manufactured.

Theory—

(a) Timber—Structure of wood—Economical conversion of logs for strength and maximum output. Plain and quarter sawn timber. Rudimentary knowledge of natural artificial process of seasoning. Defects and diseases of timbers. Classification of provincial furniture and domestic timbers.

(b) Theory of furniture—Construction for strength and appearance. Ply-woods, their properties, structure, etc. Furniture material and appliance.

3. Wood Finishing and Painting courses—2 years.

Practical work—

Preliminary glass papering, the papering block, papering mouldings.

Staining. Preparation and its application.

Grain Filter—Preparation, its application.

French Polishes.

Rubber—Its formation, filling in, dipping up, handling rubber, covering capacity of shellac polish.

Polishing faults and their remedies.

Other finishes. Egg shell finish, waxing, preparation, etc.

Varnishing—application.

Lacquering.

Spray Lacquers—Plant and its parts, spray gun and its details, operation and care.

Painting.

Brushes and tools—Care and preservation materials.

Lettering. Simple and block letters in English and vernacular sign-board writing, stencils and stenciling for decorative purposes.

Drawing Courses.—Freehand drawing of straight lines, curves, combination of both—simple floral designs; lettering plain and block in English and vernacular, stencil design and cutting.

Theory—

Polishing and Painting, lacquering materials, their properties and uses.

4. Upholstery course—2 years.

Practical work—

Tools—their care and use. Size and shapes of frames for various upholstered furniture.

Webbing.

Sprining.

Stuffing.

Covering—Setting out for covering material, cutting patterns, cutting cloth and stitching beading, gumping, plain pleating and buttoning covers, bordering handing, spinning and studding, piping work.

Upholstering in complete. Sofas, easy chairs, couches, cushions, ottomans, motor car seats, etc.

Repairing and renovating upholstered furniture—Mattress making repairing, cutting and fitting car hoods, working on leather so far as upholstery work is concerned.

Sewing machine—Knowledge of working parts, its operation.

Caning—Caning seats and backs of furniture, varieties of canes and cost—peeling case.

Drawing—Freehand drawing. Simple leaves and flowers and freehand sketching of upholstered goods.

Theory—

Upholstery materials, their properties and uses.

APPENDIX III

GOVERNMENT TECHNICAL INSTITUTES, LUCKNOW AND GORAKHPUR

Origin and Objects

(a) Government Technical Institute, Lucknow—The origin of the present Institute can be traced back to the Industrial School which was started in Lucknow in 1892, with the object of training men as railway artisans. Elementary general education was combined with technical training and boys belonging to artisan classes only were admitted. The number of the students from the Artisan classes however fell off gradually and those joining the school appeared to be attracted more by the general education than the technical training.

In 1900-02 the teaching of general educational subjects was dropped. Bazar workshops were organised on Casanova lines and a night school was started. The abolition of general education led to most students leaving the school. In less than a year the number of pupils fell from 155 to 59 and a year later to 18 of whom only 2 were artisans. The bazar workshop system of training was a complete failure and the night school had no pupils at all in March, 1903. The scheme of bazar workshops and night school was then abandoned and general education combined with industrial training was revived. The number of students rose rapidly to 205.

After the Naini Tal Conference of 1907, further drastic changes were made. The preparatory classes were closed. The small boys who formed the most numerous class in the school were sent away and the earliest age for admission was fixed at 12. In 1910-11 the staff of the school was strengthened on both the literary and industrial sides, and the equipment was increased. New workshops were added. The mechanics class was transferred from Roorkee. In 1913-14 the Automobile Drivers Class was also transferred and in 1914-15 a class for Oil Engine Drivers was formed.

Thus since 1920 the object of the institution has been to supply a better class of mechanic than had been obtainable. The men trained in the school, after further practical experience would be qualified to manage small factories and act as engineering assistants in large factories with the possibility of taking independent charge eventually.

After the above system had been in force for some years, complaints began to come in from employers that the students could not handle even ordinary engineering jobs satisfactorily, while the students complained that they could not get suitable jobs after passing out. To remove these defects in training, a reorganisation scheme was drawn up in 1930 by the Deputy Director of Industries. The present courses, which came into force in 1931, are the result of that scheme.

(b) Government Technical Institute, Gorakhpur—The Institute was started in 1911 for imparting training in various branches connected with mechanical and electrical engineering and had three classes, viz., (1) Mechanics, (2) Artisan and (3) Junior class. Educational qualification for admission to the mechanics class was fixed at the VIII standard of Anglo-Vernacular schools and for the Junior class at the IV or V standard. The latter served as a feeder class to the former. The junior class was closed in the year 1923. Students who had studied up to the IV standard were eligible for admission to the Artisan class. There has been no radical change in the courses and the policy of the school since its inception, excepting for the fact that students with better educational qualifications, i. e., those who have passed the High School examination, are now admitted to the Mechanics course. The designation of this course has been changed to "Mechanical and Electrical Engineering course" with the raising of the admission qualification, the standard of training imparted being also made higher.

Courses of Study

(a) Government Technical Institute, Lucknow—

The present courses consist of the following:

- (1) Diploma course in Mechanical Engineering.
- (2) Diploma course in Electrical Engineering.

Admission qualification—High School Examination with science or equivalent qualification.

Duration of Training—3 years at the Institute followed by 2 years apprenticeship in outside workshops.

- (3) Light Machine Mechanics Course—

Admission qualification VIII class of A. V. schools.

Duration of training—3 years at the Institute.

- (4) Painting and Polishing Class—

Admission qualification—III to IV class of A. V. schools.

Duration of training—3 years at the Institute.

- (5) Engine Drivers' Class—

Admission qualification—Literate in one of the vernaculars.

Duration of training—5½ months.

(b) Government Technical Institute, Gorakhpur—

The present courses consist of the following:

(1) The Mechanical and Electrical Engineering Class.

Admission qualification—A competitive examination for selecting candidates for admission is held in July each year. For admission to the competitive examination candidates must have read up to X standard or possess equivalent qualifications.

Duration of training, 3 years at the Institute followed by 2 years apprenticeship at a recognized workshop.

Artisan class—

Admission qualification—Upper primary examination of the vernacular schools or IV standard of Anglo-vernacular schools. Admission is made by selection and competitive examination in Arithmetic and the language selected.

Duration of training—3 years.

Selections—Selected candidates are trained in any one of the following sections according to vacancies in the workshop.

(i) Smithy and fitting.

(ii) Carpentry and moulding.

(iii) Machine shop.

(iv) Engine and Boiler Attendants' Work.

(v) Electrical Wireman's work.

Recommendations

The Committee's recommendations in regard to the courses of training are summarised below:

(1) The following three classes at the Lucknow Institute will remain unaltered—

Light Machines Mechanics class,

Painting and Polishing class,

Engine Drivers' class.

(2) The Mechanical and Electrical Engineering classes at Lucknow and Gorakhpur and the Artisan class at Gorakhpur, in their present form, are to be discontinued. In place of these the following two courses are to be started—

Mechanics course—at Lucknow and Gorakhpur,
Diploma course in Mechanical or Electrical Engineering
—Lucknow only.

(3) Mechanics Course—

(i) Instead of the present system of turning out 20 or 25 "Engineering" students every year from the two Institutes, for whom there is little demand, the training at both of them should be so arranged as to turn out mechanics with sound practical training in one or two selected trades. The list given in the Annexure to the present Appendix shows the grouping of trades approved for this purpose by the Committee.

(ii) The number of students to be admitted to this course in each Institute every year will be 30.

(iii) The admission qualification should not be restricted to High School passed with science but students of lower educational qualifications say up to VIII passed of the Anglo-Vernacular school may also be admitted.

(iv) Five or six students will be selected for admission to each trade in each Institute but students who have completed one year's training in one trade, can take one year's further training in one of the allied trades as grouped in the annexure. Those who want to go out after learning one trade only can do so. The system of six monthly and annual examinations will continue as at present but more importance will be attached to marks for daily course work.

(v) Workshop Theory, relating to the trade which the student has selected will be taught while the student is at work and separate lectures will also be given in the class room.

(vi) Theoretical training will also be given to all students in the technical subjects of practical mathematics, applied mechanics, heat engines, applied electricity, machine construction and drawing but it will be limited to approximately a quarter of the total time spent by the students in the Institute. The training will be progressive in each subject from year to year and will continue as such for the Engineering Diploma students also up to the end of the IV year.

(vii) Mechanics Course students who have received training in two allied trades but have not been selected for admission to the Engineering Course, can either leave the

Institute or continue their training for one year more for gaining further proficiency in one of the trades learnt.

(4) Mechanical or Electrical Engineering course---

(i) For admission to this course, students should have (a) passed the High School examination with science or possess higher qualifications and (b) completed the Mechanic's course at the Lucknow or Gorakhpur Institute in two trades from Group I or Group II after undergoing two years' training.

(ii) The number of admissions each year will be restricted to 10. Selection will be made in order of merit from those passing out of the mechanics class from both institutes each year, provided they have qualified in two trades.

(iii) The period of training in the Diploma course will be two years and students will qualify either in Mechanical or Electrical engineering.

(iv) Practical training in the third and fourth year for the Engineering Diploma course will be given as follows :

Students selected from Group I—Smithy six months ; Moulding three months ; carpentry three months, Power House six months, Fitting and Machine shops in which students will have to manufacture complete pieces of of machinery Mechanical Engineering students six months ; Electrical Engineering students four months. Electrical Engineering students will have to devote two months to electric wiring.

Students selected from Group II—Machine Shop six months ; Moulding three months ; Carpentry three months ; Power House six months ; Fitting and Machine shops in which the students will have to manufacture complete pieces of machinery, Mechanical Engineering students six months, Electrical Engineering students four months. Electrical Engineering students will have to devote two months to electric wiring.

N. B.—Complete pieces of machines to be manufactured by Mechanical Engineering students will be mechanical while for Electrical Engineering students they will be electrical.

(v) Students will be required to specialise in their 4th year in electrical or mechanical engineering and their theoretical and practical training will be modified accordingly.

(vi) After departmental examinations at the end of the 4th year students will be apprenticed for a further practical training of one year in workshops, Hydro-electric or Electric Supply Companies and private factories and on the successful termination of this apprenticeship period they will be eligible for diploma in Mechanical or Electrical engineering as the case may be.

(vii) Students who have qualified for the diploma in either mechanical or electrical engineering and who desire to qualify for the other branch, will be required to attend the 4th year course at the Institute in that branch and also to serve one year's apprenticeship in the branch.

Syllabus

The detailed syllabus for the Mechanical and Electrical Engineering Diploma Classes is given in the Annexure.

Annexure to Appendix III

SYLLABUS FOR THE TECHNICAL INSTITUTES, LUCKNOW AND GORAKHPUR

Practical Mathematics

(1) Arithmetic, (2) Algebra, (3) Mensuration, plane and solid, (4) Trigonometry and (5) Logarithm.

Text-books—Elementary Practical Mathematics for Technical students by F. Castle.

References books—Practical Mathematics by Rose, Volume I. (D. U. series) Algebra, by Durrel, Trigonometry, by Loney and Hall and Knight, Mensuration, by Pierpoint, Volumes I, II and III.

1st Year—

Arithmetic—Unit of weight in British and Metric systems, contracted multiplication and division. Complex fractions, fractional measure. Decimal, recurring decimals, decimal measures. Square root and cube root. Ratio and proportions. Profit and Loss. Simple interest.

Algebra. Symbolic expressions, substitution, brackets, addition, subtraction, multiplication and division. Formulæ and their application. Simple factors. Highest common factors, lowest common multiple. Fractions. Easy Problems leading to simple and simultaneous equations.

Mensuration. (Plane) Units of length in British and metric systems. Unit of area in British and metric systems. Units of weight and their comparison with Indian weights.

(Plane figures) areas and lengths of squares, rectangles, triangles, quadrilaterals and circles.

Mensuration of solids. Unit of volume in British and metric systems. Volumes of rectangular solids, regular prisms, Cylinders and rings.

Trigonometry. Measurement of angles, sexagesimal and centesimal measures. Trigonometrical ratios of simple angles. Relations between the ratios. Easy identities.

Logarithms. Use of logarithmic tables. Multiplication, division, involution and evolution by logs.

2nd Year—

Mathematics.

Arithmetic. Complex problems, division into proportional parts. Average value. Percentage. Compound interest.

Algebra. Simultaneous equations of two or more unknown quantities, and problems leading to simultaneous equations. Difficult factors, Graphs of linear functions. Theory of indices.

Mensuration. (Plane) Areas and lengths of polygons, irregular rectilinear figures, similar figures and ellipse. Chords, arcs, sectors, and segments of circles, Simpson's Rule.

Mensuration (Solid). Volumes of Pyramids, cones, frustum of pyramids and cones, spheres and spherical shells.

Trigonometry. Trigonometrical ratios of certain angles such as 45° , 60° , and 30° . Complementary angles. Use of tables of natural functions. Easy Trigonometrical equations. Solution of right angled triangles. Easy problems on heights and distances. Radian or circular measure.

Logarithms. Logarithms and slide rule. Evaluation of engineering formulae by logs.

3rd Year—

Algebra—Arithmetical, geometrical and Harmonic progression Permutation and combination. Binomial theorem. Theory of Quadratic equations.

Mensuration—Volumes of oblique frusta of right regular prisms, right circular cylinders. Zone of spheres. Segment and sector of spheres and similar solids. Surfaces of solids.

Trigonometry—7/8 Functions of compound angles. The trigonometrical ratios of the sum and difference of angles and of multiples of angles.

Logarithms—Harder examples on logarithms.

4th Year—

In this year the practical calculations will be given upon mechanical and electrical formulae. Further application of trigonometry and logarithm to jig and tool design problems. Practical calculations necessary to preparation of estimates of work and castings. Harder problems on second and third year courses.

Applied Mechanics

(1) Statics, (2) Dynamics, (3) Hydraulics, (4) Strength of Materials.

Text-books—Applied Mechanics by Jamieson.

Reference books—Applied Mechanics by Jamieson.

Applied Mechanics by Cryer and Jordan.

Mechanics for Engineers by Duncan.

Definition of the terms used in Mechanics—

Force, triangle of forces, parallelogram of forces, polygon of forces, Work—unit of work, work done against uniform resistance uniformly increasing resistance and decreasing resistance. Combination of uniform and variable loads. Horse power, moment of force. Principles of moments—applied to levers, orders of levers, practical applications of levers, the steel yard or Roman balance, Lever safety Valve, Lever machine for testing the tensile strength of materials, bent levers and other types of levers. Simple machines—Simple and compound wheel and axle, winch barrel ships capstan, the fusee of a clock or watch. System of pulleys, Pulley block and tackle.

First Year—

Weston's Differential Pulley Block.

Dynamics: Motion and velocity. Uniform, variable, linear and angular velocity. Unit of velocity, unit of acceleration, acceleration due to gravity.

Hydraulics, Transmission of pressure by liquids. Pascal's Law. 'Head' or pressure of a liquid at different depths.

Strength of Materials: Properties of materials, used by mechanics (important ones). Stress, strain, and Young's modulus of elasticity. Safe loads. Ultimate strengths. Limit of elasticity. Hook's law. Factor of Safety.

Second Year—

Statics—Forces in simple structures. Inclined plane ; Friction, laws of friction. Demonstration of 1st and 2nd laws of friction. Angle of friction, limiting angle of resistance, work done on incline including friction.

Transmission of motion and power by belts, ropes and spur gearing. Machines such as single purchase Winch Carb, double purchase winch carb, jib cranes.

Change wheels for cutting screw threads on a lathe.

Centre of parallel forces, centre of gravity.

Dynamics. Formulæ for falling bodies. Formulæ for linear velocity and uniform acceleration. Centrifugal force due to motion in a circle. Potential energy, kinetic energy, momentum. Inertia and force.

Hydraulics. Total pressure on a surface immersed in a liquid, centre of pressure, Law of Archimedes applied to immersed and floating bodies. Atmospheric pressure, mercury barometers. Low pressure and vacuum, water gauges.

Hydraulic Machines. The common suction pump, the plunger or single acting force pump, force pump with air vessel. Combined plunger and bucket pump, double acting force pump.

Strength of Materials. Strength of boiler shell. Strength of riveted joints. Single and double riveted lap joints. Easy examples on strength and stiffness of beams. Torque or twisting moment transmitted by a shaft.

Third Year—

Statics. Determination of forces in hinged structures, resultant of forces not meeting at a point. Determination of C. G. of an area. Moment of inertia of a beam. T. O. lar and other sections as commonly used in strength of materials calculation. Radius of gyration.

Dynamics. Accumulated work in rotating body. Fly-wheel. Radius of gyration. The fly-press. Energy stored in rotating fly-wheel. Motion on railway curves.

Various mechanisms, reversing and quick return motions cams and their uses.

Hydraulics. Bernoulli's theorem. Energy of fluids in motion.

Orifices. Flow through pipes. Hydraulic Press. Hydraulic Jack. Hydraulic accumulator.

Strength of Materials. S. F. and bending moment diagrams of simple supported beams, of cantilever. Calculation of size of beam to carry

concentrated and uniformly distributed loads. Strength of solid and hollow shaft. Torsion of wires. H. P. transmitted by shaft at various speeds.

Fourth Year—

Applied mechanics. Bending moments. Shearing forces for beams loaded in any manner. Construction diagram to illustrate this and graphic solution. Determination of centre of area. Moments of inertia and resistance. Struts and pillars. Effect of the form of cross section and length of strut or pillar and the effect of fixing the ends.

Hydraulics. Flow of water through pipes. Discharge through orifices. Flow over notches—rectangular and triangular. Water turbines and hydraulic pumps.

Heat Engines

(1) Heat, (2) Boilers, (3) Engines, (steam), (4) Engines (Internal Combustion and (5) Turbines.

Text-books—Ripper's heat Engine revised by A. T. J. Kersey.

Reference books—Steam and other Engines by Duncan.

Heat Engine by Jamieson.

Heat Engine by D. A. Low.

First Year—

Heat—Heat, its nature and effects. Temperature, Thermometers. Quantity of heat, specific heat. Unit of Heat. Absolute temperature, mechanical equivalent of heat. 1st law of Thermodynamics. Transfer of heat. Application of heat to solids. Coefficient of linear expansion. Application of heat to gases. Pressure of air, Absolute pressure. Application of heat to water, boiling, condensation of steam, vacuum. The Pulsometer. New-comen's atmospheric engine, Action of heat in the formation of steam, work done by steam during formation at low and high pressures respectively. Efficiency of steam. Heat rejected by steam to condenser. Sensible heat, Latent heat total heat of evaporation. Table of properties of saturated steam. Temperature of mixtures condensing water. Relation between the pressure and volume of gases, Boyle's Law, Charles Law, Hyperbolic curve.

Boilers. Resistance of cylindrical vessels, Description of Boilers—The Cornish, Lancashire, Vertical.

Babcox Wilcox and Marine Boilers.

Engines—Description of steam engine and its working. Internal Combustion engines. Principle of working of internal combustion engines. Cycle of operations of 4 and 2 stroke cycle engines. Steam Turbines—Simple description of Reaction and Impulse Turbine.

Second Year—

Heat. Combination of Boyles and Charles Laws. Expansive working, work done by steam used expansively. Back pressure, mean pressure, Indicated Horse Power. Limit of useful expansion. Clearance in the Cylinder. Printing, Cylinder condensation.

Boilers—Detailed description with sketches of Babcock and Wilcox—Lancashire, Cornish, Locomotive marine and Vertical Boilers. General fittings of boilers.

Engines. Steam engine details the cylinder, the cylinder liner steam jacket, scape valve, relief cocks, piston, piston rods, cross head, guide blocks, relative positions of piston and crank pins. The slide-valve lap, lead, angle of advance, piston slide Valve Double ported slide valve. Eccentric to set a slide valve. Reversing gear, the link motion, Zeuner's Releaux and Bilgram Diagrams.

Internal Combustion engine. Theory of internal combustion engines. Valve setting, timing, Ignition arrangements. System of oil supply. Method of vaporisation. System of cooling, system of governing.

Turbines. Pressure compound, velocity compound and pressure and velocity compound turbines. Pressure and velocity curves.

Third Year—

Boilers. Performance of steam boilers. Superheaters. Exhaust steam feed water heaters, Economisers, calorific value of fuels. Combustion factor to be considered in efficient working of Boilers i. e., draught, firing, cleaning of fires, etc.

Engines. Drop valve, Corliss Valve and Valve gears—Reversing gears—Stephenson's link gear, Walsheart's Valve gear Joy's valve gear. Crank effort diagrams and Compound engines.

Internal Combustion Engines—Types of engines, Diesel, semi-diesel, and high compression and low-compression engines, Governors, Indicator diagrams.

Turbines. General description with sketches of De Laval, Parson, Rateau-Zolley Curtiss, Ljungstrom Turbines.

Fourth Year—

Boilers. Testing of Boilers, Practical notes on Cars and Maintenance of boilers, steam boiler defects.

Engines. Testing of engines—I. H. P., B. H. P. Mechanical efficiency and Thermal efficiency. Practical Notes on the care and management of engines.

Internal Combustion engines. Testing of engines, Properties and Calorific Value of oil and gases, Gas producers, Practical notes on the care and management of engines. Petrol engines, Carburetter, Water circulation system, sparking plug, methods of producing spark, advance and retardation of spark.

Turbines. Combination turbines, velocity diagrams, Practical notes on the care and management of turbines.

Electrical Engineering

(1) Electricity and Magnetism, (2) Measuring Instruments, (3) Primary and Secondary cells, (4) D. C. Generators, A. C. Generators, (5) D. C. Motors. A. C. Motors, (6) Lighting, heating and illumination, Incandescent Lamps, (7) Switches and Switch Boards, and (8) Distribution of electricity D. C. and A. C.

Text-books—Technical Electricity by Davidge and Hutchinson. Revised Edition.

Alternating Currents by L. T. Agger.

Reference books—Electrical Engineering by MacCall, Vols. I and II.

Alternating Current by P. Kemp.

First Year—

1. Units and standards. Conductors and insulators. Magnetism—permanent magnets, magnetic metals, methods of magnetising. Ohms Law. Fundamental facts of Static electricity. Production of electric currents.

2. Measuring Instruments. Fundamental principles of electrical measuring instruments, moving coil, moving iron, and hot wire ammeter and volt meters.

3. Description of primary cells.

4. Generators—Line diagrams of series and shunt compound generators and their simple description.

5. Motors—Description of series, shunt and compound motors.

6. Lighting, etc. Heating effect of electric current. Heating of cables, wires and fuses and their dimensions. Description of carbon and metal filament lamps.

7. Tumbler switches, single pole and double pole switches. Elementary description of a switch board.

8. Distribution of electricity. Power and current taken by domestic appliances and calculation of suitable sections of wires.

Second Year—

1. Electricity and Magnetism. Magnetic circuit, Magnetic flux, magnetomotive force. Permeability and susceptibility. Hysteresis. Electro magnets.

Resistance and its measurements, temperature co-efficient of resistance. Ohm's law and its application to series and parallel circuits. Kirchhoff's Law and their application to a network of conductors.

2. Measuring instruments. Energy meters. Ampere hour meter and watt hour meter. Megger, Ohmmeters, Potentio-meters, Wheatstone bridge, Post Office Box.

3. Secondary cells, Behaviour of secondary cells during charge and discharge. Their efficiency.

4. and 5. Generators, description of continuous current, series shunt and compound generators and motors. Their characteristic curves. Motor starters.

6. Illumination—Laws of illumination, definition of standard C. P. secondary standard, Photometers, Mean spherical Candle Power. Arc Lamp and gas filled metal filament lamps.

7. Multiple way switches. Field breaking switches. Battery regulating switches, Overload circuit breakers, tripping coil, relays.

8. Distribution. Voltage drop and efficiency, advantages and disadvantages of high pressure transmission. Two and three wire systems of distribution. Balancer. Saving of copper in 3 wire system.

Third Year—

1. Elements of alternating current—principles of graphical representation of alternating current, frequency, phase, R. M. S. value of alternating current or voltage. Inductance. Capacity. Impedance.

2. Instruments: Hot wire type, electrostatic type and dynamometer type (ammeter and voltmeter Wattmeter) frequency meter and current transformer.

3. and 4. D. C. Generator and motors. Description of armature, commutator, and brush gear. Lap and wave winding. Armature reaction. Sparking and methods of dealing with it. Speed control of c. c. motors.

5. A. C. Generators, etc. Description of fly-wheel type. A. C. Generator. Induction motor—Synchronous motors. Single phase 2 phase and 3 phase.

6. Minimum and reverse current cutouts. Time limit devices. Switch board panel for D. C. Generator.

7. Power Transmission. Efficient and cheap power transmission. Kelvin's Rule. Comparison of 2 wire and 3 wire system. A. C. system of transmission by high tension.

Fourth Year—

Circle diagrams. Iron losses. Polyphase currents. Rotating fields. Transformers. Single phase and 3 phase. Equivalent circuits. Short circuits, and open circuit test. Regulation diagram.

Alternators ; E. M. F. equation, breadth factor, regulation of alternator, synchronising of alternator and parallel running. P. F. improvement by synchronous motor and condenser.

Induction motor single phase and polyphase. Stators for single phase and polyphase induction motors. Circle diagram.

Rotary Converters and mercury arc rectifiers simple description only. Location of troubles in electric machinery and their remedies.

Drawing and Design

First Year—

Text-books—Drawing by Parkinson, Intermediate Drawing, by Parkinson.

Reference books—Engineering Drawing, Volume I, by T. Jones and T. J. Jones, Machine Design, by D. A. Low Electrical Wiring by W. G. Ibbetson. Electrical Circuits and Installation, by W. S. Ibbetson.

Drawing Instruments, construction and use of scales, construction of regular rectilinear figures. Circles, tangents. Inscribed and described figures. Application to the above geometric principles to simple machines. Details such as bolts, nuts, studs, screws, etc. Freehand sketching of simple machine parts. Proportionate sizes of bolts, screws, nuts and rivets. Pulleys with straight and curved arms. Spanners, simple riveted joints.

Second Year—

Rivets. Various forms, riveted joints and their proportions, bolts, nuts, screws of Whitworth American, British Association and metric standards their sizes and proportions. Methods of locking and screwing nuts and screws. Shafting, couplings, keys, and various types of shaft bearings, span between the bearings, pipe and pipe joints. Stuffing box and gland. Scale drawing.

Third Year—

Spar, Bevel and Worm gearing. Methods of cutting out cycloids, involutes, epicycloids, and hypocycloids. The Helix, Design of riveted joints—single riveted lap joints, double riveted lap joint. Butt joints.

single and double riveted. Screw threads. Flanges, cotter joints. Shaft couplings. Plummer blocks and brasses. Working drawing from sketches or actual parts of machine tools. Valves, valve gears. Boiler—Details, workshop fittings and other appliances. Simple electrical wiring diagrams and fittings.

Fourth Year—

Cam and Cam design, treble and quadruple and other difficult types of butt joints. Explanation of isometric and orthographic drawings. Ferroprussiate process.

Electrical. Details of various parts of the Dynamo and motors, wiring diagrams of power generating stations, switchboards and layouts for house and factory wiring from public supply. Preparation of scale drawings for preparation of estimates. Ferroprussiate process.

Machinist and Turners' course

Practical Work—

Tools. Lathe tools, callipers, inside and outside, a marking gauge, centre punch, etc. their use, construction cutting angles and maintenance.

Workshop equipment. Lathes, Capstan lathe, Drilling machine, grinders, shaping and planing machines, milling machine and slotting machine etc. their care and maintenance.

Workshop practice. Study of constructional details such as lathe beds, lathe centres, mandrill and mandrill work, feeding mechanism. Tools to be used for various metals under different conditions. Relation of tools to work. Feeds and speeds, simple turning, taper turning, boring, chucking and facing and screw, cutting. Use of drilling, shaping, planing, milling, and slotting machines, method of holding work pieces on above machines. Manufacture of finished article from all above machines with the help of drawings, blue-prints, samples etc.

N. B.—Those who want further training in any of the above trades for a period of another year will be given advanced work with further details of the equipment, etc.

Workshop Theory—

The training in workshop theory will be based on the syllabus prescribed for the practical and this will be given as far as possible while the students are at work supplemented by class lectures when necessary.

Fitting shop. Technology and uses of tools simple details of equipment.

Workshop practice. Chipping, filing, scraping, and shaping of tools. Smithy shop. Technology and uses of tools and simple details of equipment.

Workshop practice. Processes of upsetting and drawing down, making and tempering of machine shop tools, etc.

Fitters

Practical Work—

Tools, Hammers, files, scrapers, chisels, callipers, squares, marking off tools, centre punches, Dies, Taps, Micrometer gauges, etc. Their uses, construction and maintenance.

Workshop equipment. Fitters benches, vices, face plates, etc.

Workshop practice. Chipping, filing, fitting, scraping, making surfaces flat by these methods, making gauges and formers. Fitting keys and cotters, cutting keyways in shaft by hand, making and finishing such tools as box squares, squares, callipers, depth gauges, scribes, angle gauges, etc. Fitting plug and ring gauges, squares, hexagons, triangles and similar regular figures. Marking of positions of holes, keyways, etc. Difficult marking off operations on the marking of table from the blue prints and drawings of machines, etc. The manufacture of such tools as drifts, reamers, broaches, various types of wrenches, spanners, etc. Fitting and adjusting bearings. Fitting and erection of complete pieces of machinery, line shaftings, etc.

Smithy shop. Technology and uses of tools and simple details of equipment.

Workshop practice. Processes of upsetting and drawing down making chisels, punches and drifts, etc.

Machine shop. Technology and uses of tools and simple details of equipment.

Workshop practice. Drilling, tool grinding and grinding flat surfaces.

N.B.—Those who want further training in the above trade for a period of another year will be given advanced work with further details of equipment,

Workshop Theory

The training in workshop theory will be based on the syllabus prescribed for the Practical and this will be given as far as possible while the students are at work supplemented by class lectures where necessary.

Smiths

Practical Work—

Tools. Hammers, tongs, flatteners chisels, anvils, etc.

Workshop equipment. Smiths hearths, electrically driven blowers, etc.

Workshop practice. Process of upsetting and drawing down, making small forgings, such as keys, links, carriers, rings, eye-bands, bolts, nuts, spanners, Khurpas, Ghandasas, Karuchchuls, saws, etc.

Making different types of mechanical welds, bending and welding angle and tee irons, etc.

Fitting shop.—Technology and uses of tool and simple details of equipment.

Workshop practice—

Chipping, filing, scraping, shaping of tools, etc.

N.B.—Those who want further training in the above trade for a period of another year will be given advanced work with further details of the equipment.

Workshop Theory—

The training in workshop theory will be based on syllabus prescribed for the Practical and this will be given as far as possible while the students are at work supplemented by class lectures when necessary.

Moulders

Practical Work—

1. Tools. Use of Moulders tools, trowels, cleaners, steckers, etc.

2. Workshop equipment. Cupols, crucible and brass furnaces, moulding boxes, ladles, etc.

3. Workshop practice. Various types of sand, green-sand, dry sand and loam sand. Simple moulding in boxes and open sand, strickling, stopping off, burning on, ventilation of moulds, gates and gating, risers. Use of core and core making, method of supporting cores, drawback, etc. of below parts. Causes of blowholes and dirt in castings, defects in castings and their remedies, chilled castings, brass, gun metal and aluminium casting. How to work on cupola, crucible and brass furnaces. Dressing of fettling castings, pickling and castings. Remetalling of bearings. Preparation of castings of every description, heavy, light, ornamental, etc.

N.B.—Those who want further training in the above trade for a period of another year will be given advanced work with further details of the equipment.

Workshop Theory—

The training in workshop theory will be based on the syllabus prescribed for the practical and this will be given as far as possible while the students are at work supplemented by lectures when necessary.

*Welders**Practical Work—*

Tools and equipment : Quasi arc welding set. Oxy Acetylene Welding set. Acetylene generator, etc.

Workshop practice. Principles of electric arc and oxy acetylene welding. Welding on the flat form, making a butt joint by the building up method, lap-weld fillet joint made with electric arc. Butt welding of sheet metal, butt welding of thicker plates. Seam welding, spot welding and welding of carbon and high speed steel for cutting edges. Oxyacetylene welding both low pressure and high pressure system. Butt joints by oxyacetylene method. Welding of cast iron, cutting metal by oxyacetylene flame.

Fitting shop. Technology and use of tools and simple details of equipment.

Workshop practice— Chipping, filing, cutting Vee grooves, etc.

N.B.—Those who want further training in the above trade for a period of another year will be given advanced work with further details of the equipment.

Workshop Theory—

The training in workshop theory will be based on the syllabus prescribed for the practical and this will be given as far as possible while the students are at work supplemented by class lectures when necessary.

*Electric Wiremen**Practical Work—*

Carpentry shop. Technology and uses of tools and simple details of equipment.

Workshop practice—Sawing, chiselling, planing, making simple joints in casing and capping, etc.

Wiring: Technology and uses of tools and simple details of equipment.

Workshop practice. Nature and use of soldering materials and fluxes. Practical wiring work to be done in connection with simple example including two way switches. Joining V. I. R. cables up to 7/0.064.

Straight and Tee joints. Joints on H. D. copper wire up to 10 s.w.g. Simple wiring scheme for the lighting of one or more rooms of a building to be worked on paper. Method and wiring of motors, generators and switch-boards. Repairing and rewinding of armatures of motors and repairs of fans and other domestic appliances.

Workshop Theory—

The training in workshop theory will be based on the syllabus prescribed for the practical and this should be given as far as possible while the students are at work supplemented by class lectures when necessary.

Schedule

SCHEDULE OF TRAINING FOR MECHANICS IN THE GOVERNMENT TECHNICAL INSTITUTES, LUCKNOW AND GORAKHPUR

Total period of 12 months of which one-fourth will be devoted to theoretical training for each trade—

1. Turner and Machinist—				} Group I.
Machine shop	...	...	... 10 months
Fitters shop for tool making	...	...	... 1 month
Smiths shop for tool making	...	...	... 1 "
2. Fitters—				} Group II.
Fitting shop	...	...	... 9 months
Smith's shop	...	...	... 1½ "
Drills, grinders, and surface grinders	...	...	... 1½ "
3. Smiths and Ordinary tool makers—				} Group III
Smiths shop including of grinding of tools	...	...	... 10 "
Fitters shop	...	...	... 2 "
4. Moulders—				} Group IV*
Moulding shop	...	...	... 12 months
5. Welders—				} Group III
Welding shop	...	...	... 11 "
Fitting shop (Chipping and Filing)	...	...	... 1 "
6. Electric wiremen—				} Group IV*
Carpentry and Joinery	...	...	... 2 months
Electric Wiremen work	...	...	... 10 "

*There is a great demand for such men but this trade can be taken in the Lucknow Institute if a Wiring Instructor is appointed. There was an Instructor in this trade but the post was abolished. This may be restored.

APPENDIX IV

SUMMARY OF RECOMMENDATIONS

Present system of education

1. A noble effort in spending on an average not less than Rs. 1,500 per pupil to equip him to earn his living and to improve the country's economy has been, in our opinion, wasted. (Paragraph 14.)

Practical training

2. No amount of theory can be a substitute for practice and until this is realized we shall continue to produce men unacceptable to industry. We are, therefore, of opinion that theoretical instruction should occupy not more than one third of the time devoted to practical work. (Paragraph 15.)

3. Our conception of industrial training is that it is one which enables the student to practise the trade under competitive conditions on leaving the school. (Paragraph 17.)

4. What we should aim at is the transplantation of a part of the factory in the institutes. Practical training should, we consider, form the backbone of the instruction. (Paragraph 18.)

Appointment of Master tradesmen

5. The staff of these institutions should be recruited from the ranks of those who have made good in the industry to the extent of getting a good living out of it. The training should be given by master tradesmen and not by class-room lectures who should have theoretical qualifications followed by considerable 'Works' experience. For technical subjects especially, craftsmen should be imported from commercial undertakings. (Paragraph 19.)

Wages in place of stipends

6. After an initial period of about six months when a student is learning the basic principles, the system of stipends should be abandoned and there should be substituted in its place a system of wages based on the quality and quantity of work judged by competitive standards which take account also of the time taken for the work.

Rates of wages which will have to be paid will of necessity have to be higher than the market rate. It may be made clear that the amount to be allotted in the budget should not be less than the amount now provided for stipends. (Paragraph 20.)

Demand for Degrees

7. We do not recommend any modification of the existing system of award of diplomas and we are not in favour of altering the system of education to suit award of degrees in place of diplomas. We, however, suggest that suitable steps should be taken by the department for making known to prospective employers the nature of training which is given at these institutions. (Paragraph 21.)

Employment of students

8. The heads of institutions and the department should do everything possible to find employment for the students and should take all possible steps to bring them to the notice of the employers. For this purpose the heads of institutions should keep themselves in close touch with industry. (Paragraph 22.)

Duration of courses

9. Working hours per day and working days in the year should be considerably more than what they are at present. The working hours per week should be 42 in the first year, 45 in the second and 48 in the third year. Number of working days in the year should be increased to 275 in all the years. Extra hours due to this increase should be devoted to practical work alone. Government should provide in the budget larger allotments for raw material and wastage, etc. (Paragraph 23.)

10. We suggest radical changes in the system of training: (a) theoretical instruction shall be subordinated to practical, (b) time devoted to drawing shall be appreciably reduced without affecting the standard. About 50 hours of instruction in drawing during the whole course will be ample for the requirement of most pupils except those qualifying for diploma in engineering. If this arrangement, however, is not found to work satisfactorily, the time for this subject may be increased. (Paragraph 25.)

Dignity of labour

11. Boys should be put to the work done by the coolies and this item of expenditure should be considerably curtailed if not entirely eliminated from the budget provision. (Paragraph 26.)

Staff

12. Teachers should be engaged on short-term contracts of not more than five years' duration which will not ordinarily be renewed unless the teacher can show that he has kept himself up to date in his subject. As regards the present staff, if some of them can be retired, it should be done and in other cases an efficiency bar be introduced. (Paragraph 27.)

Artizan and non-artizan courses

13. The present artizan and non-artizan courses are needless duplication. This distinction should be abolished and a combined course be introduced for all pupils. (*Paragraph 28.*)

Selection of pupils

14. Prior to giving training, pupils seeking admission should undergo a satisfactory test regarding physical fitness. (*Paragraph 29.*)

Expert panel of outside businessmen

15. An expert panel of outside businessmen should be appointed whose function it should be to inspect the institutions periodically and submit comprehensive reports to the department. A fee should be paid for these inspections. (*Paragraph 30.*)

Advisory Committees

16. Recommendations of the Advisory Committees should be adopted by Government without undue delay except perhaps in very rare instances where a convincing and cogent case exists against their adoption. Members of the Committee, specially those drawn from the industry, should be requested to inspect the schools from time to time and to make suggestions. Their good offices should also be utilized for making arrangements for the practical training of students and for their securing employment. (*Paragraph 31.*)

Instruction in Vernacular

17. We are convinced that instruction in the vernacular would produce better results. (*Paragraph 32.*)

Grant of Diploma or Certificate

18. The grant of a diploma or certificate should be conditional entirely on the attainment of a prescribed standard of efficiency in quality and quantity of output performed under competitive and business conditions (*Paragraph 33*)

Museums

19. At Benares, Bareilly and Lucknow, museums should be established with a view to demonstrate and popularise machinery used in cottage industries in other countries. It should be the constant aim of these institutions to evolve new and simpler machines which prove economical and beneficial. (*Paragraph 34*)

Aims and objective

20. The institutions appear to have had too ambitious an aim. They should have a more modest aim and objective and their efforts should be primarily directed to training men for junior supervisory posts and regular trained workmen standard. For the few who desire an advanced type of instruction, facilities should exist but this should not be imposed on all the pupils. (*Paragraph 35.*)

Prospectuses

21. The prospectuses of these institutions should be carefully revised to see that no exaggerated ideas of the value of the training are created in the minds of the pupils and their parents. (*Paragraph 36.*)

Central Textile Institute

22. We suggest that the prospects of the cotton textile industry interests in the Province taking over into their hands the management of the institution be investigated and the institution run as a grant-in-aid school—Government grant not exceeding 75 per cent. of the present expenditure. Till this change is accomplished, the management and control of the institute should be vested in a Managing Committee consisting of representatives of the industry and one Government member. The Committee should have large and real power of control and guidance. (*Paragraph 37.*)

23. Greater care should be exercised in the selection of pupils for admission to the institute. In the first year after admission, the aptitude and physical fitness of the boys should be subjected to a test. The first six months would be devoted to instruction of an elementary type in general mechanical subjects such as fitting, turning, etc., and in spinning and weaving. After this preliminary instruction the boys should be required to put in 150 working days in a mill. During this time the Principal should keep himself in touch with the boys by occasionally visiting the mills and supervising their work. (*Paragraph 38.*)

24. The scheme of syllabus of the institute admits of a considerable degree of improvement and the proposals set out in Annexures I and II to Appendix I will achieve the objects in view. (*Paragraph 39.*)

25. The course of instruction at this Institute should consist of four years in all, the first to be spent in preliminary instruction and in mill working, the second and third years to be spent at the Institute and the fourth year in apprenticeship training at the mills. (*Paragraph 40.*)

26. The pupils should be given the opportunity of dismantling and reerecting the machines so that they may have an insight into their working and understand the functions of the various parts. All the machines should

be dismantled and re-erected at least once in two years' training. The institute should be equipped with a set of new machines for practical work. A Sizing Machine is necessary and it should be provided. (*Paragraph 41.*)

27. Instruction in theory should not be given in isolation in the class-room but be accompanied by instruction in the workshop by a practical demonstration. We definitely disfavoured the syllabus being loaded with a multiplicity of subjects not necessary for the majority of the boys trained. (*Paragraph 42.*)

28. We would make a special appeal to the mills to ensure that the boys sent to them for training are looked after by the staff of the mills and to make it the responsibility of a junior officer of the mills to fill and transmit to the institute weekly diaries with details of the work done by the pupils. We would further make an earnest appeal to mill managements to assist Government by offering advice, by pointing out any changes they consider necessary to improve the institution and by employing these students in greater numbers. (*Paragraph 43.*)

29. The Institute's aim, as far as Chemical Technology section is concerned, should primarily be to equip men to fill junior posts in mills or prepare them to start their own dyeing and printing business or to train them to teach improved methods to village workers. Nomination of candidates for training as mill dyers should be left in the hands of the mills. For the training of other dyers and bleachers, the selection should be in the hands of the Principal. (*Paragraph 44.*)

30. We recommend the addition of necessary machinery for the Chemical Technology section at a cost not exceeding Rs. 10,000. (*Paragraph 45.*)

31. While we do not entirely preclude the possibility of research being conducted at the institute, we consider that for the present, it is not necessary or desirable except in the case of cottage industry. (*Paragraph 46.*)

32. We suggest that the possibility of getting spinning and weaving masters and other heads of departments of local mills for lecturing students for an hour or so each week be investigated. (*Paragraph 47.*)

Central Weaving Institute, Benares

33. A two years' course more intensive than at present is more than ample for training handloom weavers. The institute should insist on faultless work from the very beginning. (*Paragraph 50.*)

34. Admission to this institute should be restricted to pupils who have had some preliminary training in other Government primary or aided weaving schools. In admitting pupils, preference should be given to those

belonging to weaver castes and even among them to literates. (*Paragraph 51.*)

35. Practical work should take the form of marketable goods and that all earnings should be handed over to the pupils. (*Paragraph 52.*)

36. Mythological, historical and artistic designs could be made much greater use of in the trade and the institute should undertake the preparation of these, lithograph them to the full size and make prints available to the trade at a nominal charge. Appointment of a designer is necessary in the institute. (*Paragraph 53.*)

37. It is not necessary to provide for a Teachers' Training Class in this institute. Teaching diplomas may be given to such of the passed students as have read up to the vernacular middle standard. (*Paragraph 54.*)

38. Pupils on the completion of their courses should visit Mau and Tanda which are important centres of the hand-loom industry to familiarize themselves with the actual conditions of the trade. (*Paragraph 55.*)

39. Three pupils should be housed in each room of the hostel instead of two as at present. (*Paragraph 57.*)

40. Increase in the staff is not necessary. (*Paragraph 58.*)

41. Alterations should be made to the weaving sheds which would afford more ventilation at the top and sides. (*Paragraph 59.*)

42. The working of the institute may be reviewed at the end of five years. (*Paragraph 60.*)

Carpentry School, Allahabad

43. It is not desirable to have separate courses in painting, polishing and upholstery. Training in these subjects should be given to regular students of carpentry. (*Paragraph 61.*)

44. The course of instruction should be reduced from six to five years as in Bareilly. (*Paragraph 62.*)

45. The Teachers' Training Course should be abolished. (*Paragraph 63.*)

46. In future, no teacher should ordinarily be appointed to the staff who has not had commercial experience. (*Paragraph 65.*)

47. One Chinese carpenter at least should be appointed. (*Paragraph 66.*)

48. Preparing designs and making them available to the trade at a nominal charge should receive greater attention. (*Paragraph 67.*)

49. A cook should be attached to the hostel at Government expense. (*Paragraph 68.*)

50. This institute should be subordinate to the Bareilly Institute, the Principal of the latter being made responsible for the supervision and inspection of the working of this institute. (*Paragraph 69.*)

Central Wood-Working Institute, Bareilly

51. Same recommendations as in *paragraph 43* above.

52. One or two Chinese carpenters should be appointed. (*Paragraph 73.*)

53. Seasoning should be done for the trade and a fee charged for the service. If the Seasoning Department cannot be placed on a self-supporting basis in this manner, it should be abolished. (*Paragraph 73.*)

54. We should also like to compliment the Principal on his introducing into the training subjects like toy-making, basket-ware, etc. (*Paragraph 74.*)

55. A cook should be employed for the hostel at Government cost. (*Paragraph 75.*)

Technical Institute, Lucknow

56. This institute has not been catering for the demand. It should, therefore, be converted into a workshop run entirely on commercial lines. A committee of businessmen with one government nominated member should be appointed to manage the workshop. Boys to be trained will be engaged as ordinary workers. Sandwich system of training as in operation in Jhansi is recommended. There will be courses such as for fitters, turners, machinists, moulders, smiths, welders, pattern-makers, etc.

The minimum qualifications for admission should be the VIII standard. There should be facilities for giving training in Mechanical and Electrical Engineering separately. Persons who have passed the Matriculation Examination in science and who have successfully completed not less than two of the above courses should be eligible to be trained in Mechanical and Electrical Engineering separately. (*Paragraph 76.*)

57. Evening classes should also afford facilities for instruction of an advanced type. (*Paragraph 77.*)

58. The aim of the institution should primarily be to train boys to be general mechanics. For those who aspire to become engineers instruction should be available in the evening classes. (*Paragraph 78.*)

59. By adequate Government patronage and entrusting Government work and work of District Boards, Local Boards and Municipal Boards, the institute would become self-supporting. (*Paragraph 79.*)

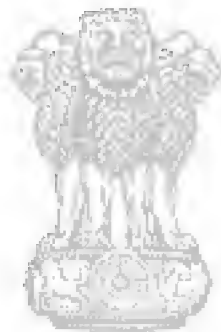
60. The Light Mechanics' course should continue but after a period of three years, the working of the whole institute should be reviewed to

appraise the value and adequacy of the modifications proposed. Motor Mechanics course should be revived in Lucknow. (*Paragraph 80.*)

Technical Institute, Gorakhpur

61. This institute should be re-organized on the same lines as at Lucknow but the aim of the institute should be confined to training general mechanics only. This applies also to the Electrical Department. (*Paragraph 81.*)

62. Manufacture of light machines at present imported may also be undertaken at this as well as the Lucknow workshops. (*Paragraph 82.*)



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